

GEOGRAPHIC ASPECTS OF HOSPITAL PLANNING

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I. AN INTRODUCTION TO THE FIELD OF REGIONAL HOSPITAL PLANNING

The purpose of this dissertation is to investigate the relationship that exists between geographic factors and the regional planning of hospitals. Regional hospital planning, as discussed in this dissertation, differs from hospital planning as generally understood by the public. The great majority of previous studies in the field of hospital planning have dealt with architectural planning of hospital buildings, and a considerable literature already exists concerning this topic. Much less is known, and much less has been written, concerning the problems of locating hospitals, of determining their size and the services they are to render, and of determining the boundaries of the areas which they are to serve.

The study of regional hospital planning is a hitherto little explored field of applied geography. It has had such precursors as medical geography and marketing geography. Medical geography has sought to determine environmental factors in the etiology of disease, and marketing geography has investigated the factor of relative location in the development of markets and its effects on business.

During recent years, many geographers and research trained social scientists have found employment in the fields of community and regional planning. During the same period, extensive programs for the construction of public institutions, including hospitals, have brought with them a need for more knowledge concerning the principles and problems of specialized areas of regional planning. Thus, there exists a need for more studies relating to these specialized areas of planning, studies which use techniques and approaches familiar to the academically trained mind, and which may be used for the education and guidance of persons engaged in the practice of regional planning.

Although the field of regional hospital planning is one of these specialized areas requiring considerable additional research, it cannot be said that previous studies have not been made, or no previous literature published, in this field. The sponsor of every new hospital project has done some thinking regarding this subject. Individual studies have been made concerning the need for proposed hospitals, or the operation of existing hospitals, and some of these have become available in print. What is almost entirely lacking is the comprehensive study, drawn from a number of different observations, which establishes general principles of regional hospital planning which may be applicable to a large number of situations.

The most nearly comprehensive study in this field to date has been the Michigan Hospital Survey Report, completed by Dr. A.C. Bachmeyer and the Michigan Hospital Study Committee in 1946. This study, prepared as a guide for the development of a hospital construction program in Michigan, covered a number of topics, including the following. 1./

1. The factors determining the effective limits of general hospital service areas.

2. The lower and upper size limits for efficient hospital operation.

3. The problems affecting areas with unusual characteristics.

4. The problems encountered in transporting patients to hospitals.

5. The methods by which future hospital bed needs might be estimated, and by which optimum rates of hospital occupancy might be calculated.

This monumental study has become justly famous; it is commonly referred to in public health circles as the "Michigan report," and one of its empirical formulae for measuring hospital bed needs has become known as the "Michigan formula." A number of studies by architects and hospital administrators have also been of note; although they have

1./ Michigan Hospital Survey Report, Michigan Hospital Study Committee, A.C. Bachmeyer, M.D., Director, Lansing, 1946, passim.

concentrated upon the design of hospital buildings, these studies have included valuable information concerning the location, size and interrelationships of hospitals. One of the pioneer works in this field was an article by the English hospital administrator, Sir Henry Burdett, published in the Eleventh Edition of the Encyclopedia Britannica in 1910. Burdett's lengthy article covered such topics as the relation of the hospital site to the physical environment and the factors governing hospital location in large urban areas.

2./

The foremost study conducted by an American architect in recent years is Hospitals, Integrated Design, written by the architect Isadore Rosenfield. This book covered the problems of hospital planning in areas having different characteristics, including the relationships between the population and the location of hospitals. 3./ Architects of other nations have contributed commendable studies of hospital planning. Gustav Birch-Lindgren has written a work entitled Modern Hospital Planning in Sweden and Other Countries.

4./ Although published in Sweden, this book is written in

2./ Sir Henry Burdett, "Hospital," The Encyclopedia Britannica, 11th Ed., Vol. XIII, pp. 791-801.

3./ Isadore Rosenfield, Hospitals, Integrated Design, 2d Ed., New York, Reinhold Pub. Corp., 1951, passim.

4./ Gustav Birch-Lindgren, Modern Hospital Planning in Sweden and Other Countries, Medens Forlags Ab., Stockholm, 1951.

English and is thus available to a wide audience. For those who can read Italian, the most recent edition of B. Franco Moretti's volume Ospedali (Hospitals) is especially recommended. 5./ Both these volumes contain material concerning the optimum size of hospital plants and the location of hospitals in the urban environment.

Further material relating to regional hospital planning has appeared as a result of organized programs for hospital construction. A number of programs of this type have been in operation within the United States during the past generation. One of the first, conducted under private auspices, was established in 1924 by the Duke Endowment. A portion of the income from this endowment was allocated to hospitals in North and South Carolina, intended partly for indigent hospitalization and partly for hospital construction and equipment.

The federal government entered the hospital construction field on a broad scale in 1935 with the creation of the Work Progress Administration, popularly referred to as the W.P.A. This was an extensive building and improvement program designed to provide work for the unemployed; a number of community hospitals were constructed under this program in addition to schools, parks and other public works.

5./ B. Franco Moretti, Ospedali, 3d Ed., Editor U. Hoepli, Milano, 1951, passim.

Although the W.P.A. was terminated in 1943, federal activity in the hospital construction field continued through the Lanham Act of 1941. This legislation provided grants of \$150,000,000 per year for the construction of public works, including hospitals, which had become necessary through the impact of the national defense program upon local communities. The annual grants were subsequently raised to \$300,000,000, and planning for hospital facilities constructed under the program was entrusted to the U.S. Public Health Service. During the war, however, many communities became reluctant to raise matching funds and participate in this program. Due to the shortage of certain materials, only temporary hospital buildings could be built, and it was often thought that such facilities would not be the best long-term public investments.

By the end of World War II a crisis had arisen in the field of hospital care. Rising prosperity and a growing population had created an unprecedented demand for general hospital beds. To make matters worse, despite the efforts of previous hospital construction programs, not enough facilities had been constructed during prior years to meet the growing demand for service and to replace unsafe and outmoded hospitals. Hospital construction had lagged since 1929, due first to the depression, then to the wartime scarcity of materials.

In 1945 Senators Lister Hill of Alabama and Harold H. Burton of Ohio introduced the Hospital Survey and Construction Act in the 79th Congress. In August, 1946, this bill was signed by President Truman and became Public Law No. 725 of that year. Popularly known as the "Hill-Burton Act," after its sponsors, it has had a far greater influence upon hospital construction and hospital planning than any previous program. Every year since 1946 has seen large sums of money, ranging from \$65,000,000 to \$150,000,000, appropriated for its operation, and it seems probable that these appropriations will continue for some time to come.

The terms of the Hill-Burton Act, like the terms of many other federal construction programs, required that the funds be allotted on a matching basis. Specifically, federal grants were authorized to the states and territories to pay part of the cost of constructing public and other non-profit hospitals and health facilities. The participating sponsors of hospitals and health facilities were required to provide additional funds to match the federal grants. The states and territories were also given the option of providing funds of their own to match those provided by the federal government and the local sponsors.

The administration of this plan was left to the individual state or territory, which designated this responsibility to one of its public agencies. In the great majority of

instances, the chosen agency was the state or territorial department of public health. Some states, such as North Carolina, had medical care commissions organized independently of the state health department and designated the commission as their official agency. Other states, such as Florida, entrusted the administration of the Hill-Burton Program to their development or planning commissions.

Any public agency chosen to administer the Hill-Burton Program is officially termed a state agency, whether it is sponsored by a state, a territory, the District of Columbia, or the Commonwealth of Puerto Rico. As part of its responsibilities of administering the construction program, the state agency is required to make a master state plan for the construction of hospitals and related health facilities. This plan must be made in accordance with regulations promulgated by the United States Public Health Service, and both the original plan and its mandatory annual revision must be submitted to the U.S. Public Health Service for approval. Nevertheless, in making this plan, there is considerable leeway for the exercising of individual judgment by members of the state agency. Some of these areas open for local judgment are the following:

1. The delineation of hospital service areas within the state, showing the districts to be served by existing or proposed hospitals.

2. The priority for granting construction funds to project sponsors within each service area.
3. The organization of existing and proposed hospitals within the state into a coordinated hospital system.
4. The assignment of extra hospital beds to hospital service areas which have unusual medical care needs.

The master plans produced by the state agencies have thus varied greatly in their content. Although all plans must contain certain basic information and must follow a basic format, there is considerable room for individual initiative in that the state planners may include, at their discretion, sections relating to the problems of regional hospital planning within the state. The extent of such material included will depend upon two factors. The first of these is the degree to which the state presents unusual problems of hospital planning. The second factor is the extent to which the state agency is aware of these problems.

Commendable material concerning regional hospital planning has been included in the plans produced by the state agencies of Oregon, New Mexico, Minnesota, Indiana, Iowa, Montana, Nebraska, Hawaii, Alaska, Vermont, Illinois, Wisconsin, Kansas, Colorado and Utah. This material constitutes a fund of information which has not been systematically analyzed for the guidance of workers in the hospital planning field.

Not only is each state agency required to prepare an orderly plan as a guide for its hospital construction activities, but it is also required to make a brief study of the first year of operation of each completed hospital project. These studies, termed post-audit surveys, analyze the success or failure of the physical plant, the location and the community relations of the hospital. One copy of each post-audit survey is forwarded to the U.S. Public Health Service in Washington, D.C., but a duplicate copy is retained for the files of the state agency. These surveys constitute a second source of material, even less known than the master state plans, relating to regional hospital planning.

This dissertation is based, in part, upon the foregoing sources of information. The author collected the bulk of the material to be analyzed while employed as a Community Survey Consultant by the Division of Hospital Services, Georgia Department of Public Health. This employment with the Georgia state agency lasted more than three years, from April, 1953, to June, 1956. The author's professional duties involved making surveys of Georgia communities which had applied for construction grants under the terms of the Hill-Burton Program, writing survey reports which gave the recommendations of the state agency regarding each application, and preparing the annual revision of the Georgia Hospital Plan. A position of this nature can give one almost

unparalleled opportunities for research in the field of regional hospital planning.

The information used in this dissertation was collected in the following manner:

1. By direct field visits to communities. During the period of employment with the Georgia state agency, fifty community visits were made by the author. The great majority of these trips were made to conduct surveys of communities which had requested construction funds under the terms of the Hill-Burton Act. A number of trips were also made to conduct post-audit surveys of completed hospital projects.

2. By discussions of hospital planning problems with individuals who visited the offices of the Georgia state agency. These individuals included people representing communities requesting grants, U.S. Public Health Service, other state agencies, and various organizations in the medical care field.

3. By a study of the files of the Georgia state agency. The material in the files included post-audit surveys, information relating to previous surveys, state hospital plans from a number of other states, and publications in the hospital and medical care fields.

These sources of information have been supplemented by material obtained from the libraries of the University of Florida. The methodology of this dissertation is thus eclectic

in nature, having drawn its information from a number of different sources by a number of different means, including field observation, interviews, and the perusal of both published literature and unpublished files.

The term "hospital" can refer to several different types of facilities, including chronic, tuberculosis and mental hospitals. This study will be limited principally to the location and distribution of general hospitals; a general hospital is defined as a facility intended primarily for the inpatient medical or surgical care of acute illness or injury, and for obstetrical care. Thus, a great deal of the care rendered by such a hospital is emergency care, in which the patient must be admitted to a hospital with the least possible delay, as opposed to elective care, in which the patient can choose, within limits, the time and place of his hospitalization. Obstetrical care, as well as the treatment of injuries and illnesses, has an emergency aspect in that it is desirable to hospitalize the patient within a short period after the onset of labor.

This emergency care function of the general hospital creates many of the regional hospital planning problems. The maintenance of modern medical care standards requires that, insofar as possible, all members of the population be within convenient access of a hospital. Anything which creates a barrier to the rapid hospitalization of a patient, be it a

physiographic feature, a political boundary, extreme distance, traffic congestion, discriminatory attitudes or laws toward certain classes of patients, or a lack of available beds, becomes a problem for the regional hospital planner to solve. General hospitals are consequently an even more complex and serious problem to the regional planner than facilities for education, recreation or non-emergency medical care. Like police and fire protection, an adequate network of general hospitals is a sine qua non for a modern society.

Thus, in this dissertation, the term "hospital" will, unless otherwise qualified, refer to general hospitals. A few more basic definitions might be made at this point for clarification:

1. Bed. This refers to a hospital bed for an adult or child patient, but not to bassinets for newborn infants. Beds in labor rooms, recovery rooms, and emergency rooms, which might be used by several patients within a twenty-four hour period, are not included in the normal bed count of a hospital.

2. Bed need. This refers not only to beds needed for hospital patients, but also to the buildings, equipment and other facilities required to serve the given number of beds.

3. Normal bed capacity. This refers to the number of beds which a given hospital is designed to provide. It differs from the bed complement, which is the number of beds

actually set up in the hospital. For planning purposes, the normal bed capacity of hospitals is used to measure the number of beds available in a given area. If fewer beds are set up than the normal capacity, then additional beds may be set up in the hospitals before new construction need be undertaken. Conversely, if more beds are permanently set up than the normal capacity of the hospitals, additional construction will be required to relieve overcrowding.

4. Average daily census of patients. This refers to the average, or the arithmetic mean, of the number of patients in a hospital for each day during a given period.

5. Occupancy rate. This term is the ratio between the average daily census of patients and the normal bed capacity of a hospital during a given period. It is generally given in percentage form. Since a hospital may have a bed complement higher than the normal bed capacity, it is possible for a hospital to have an occupancy rate higher than 100%.

6. Population. For localities within the United States, populations listed for decennial years, such as 1940 or 1950, will be those given by the United States Bureau of the Census. For localities within the state of Georgia, populations given for non-decennial years, such as 1955, will be estimates made by the Central Statistical Unit of the Georgia Department of Public Health.

Other terms, such as hospital service area and coordinated hospital system, will require a more detailed explanation and illustration to be dealt with in future chapters of this dissertation.

II. THE HOSPITAL SERVICE AREA AND THE COORDINATED HOSPITAL SYSTEM

The basic planning unit used by the regional hospital planner is the hospital service area. This unit has been defined by the United States Public Health Service in the following terms: 1./

Area. A logical hospital service area, taking into account such factors as population distribution, natural geographic boundaries, transportation and trade patterns, all parts of which are reasonably accessible to existing or proposed hospital facilities and which has been designated by the State agency as a base, intermediate or rural area.

Each state agency which administers the Hill-Burton construction program has the responsibility of dividing the state into a number of hospital service areas for administration of the state plan. It is the task of the planner to determine what the "logical hospital service areas" are, or what they would be if proposed hospitals were built, and to delineate workable approximations of these areas on a map.

The delineation of service areas must be based upon conditions existing within the areas. It is desirable to have all portions of the service area within a brief travel

1./ Public Health Service Regulations, Part 53, U.S. Department of Health, Education and Welfare, Public Health Service, Washington, 1955, Sec. 53.1.

time of the hospital facilities; this period of maximum travel is usually taken as thirty minutes by hospital planners. Within the continental United States, a distance of between 20 and 30 miles may be traversed within this period of time, assuming that there are no barriers to transportation and that the area is serviced by a network of good roads. This range of distances becomes the maximum radius for hospital service areas, provided that there is sufficient population within each service area to support a general hospital.

Where there is insufficient population to support a general hospital, or even an emergency clinic, it is desirable to supply other arrangements for medical care. Ambulance services, whether by surface transportation or by air, can bring patients from sparsely inhabited areas to modern hospitals at a much lower cost than that involved in maintaining a network of little-used hospital facilities. When the patient cannot be moved, it may be possible to transport medical personnel and portable equipment to the patient. These methods will greatly extend the size of hospital service areas in regions of low population.

On the other hand, where the population is densely concentrated, it will be possible to support efficiently sized hospitals within relatively short distances of each other. In view of the traffic congestion of urban areas,

it may prove necessary to reduce the size of hospital service areas in order to provide facilities within the convenient reach of all.

The "natural geographic boundaries" referred to by the U.S. Public Health Service are of great importance to the planner where they seriously hamper the movement of patients and personnel to the hospital. High mountain ranges and large bodies of water are the most frequent of such barriers, and they will "cut off" a portion of a hospital service area unless special steps have been undertaken to bridge them. In addition to these permanent barriers of the natural environment, the planner must be alert to the possibility of periodic barriers caused by the weather. Heavy snows and severe floods may be ranked among these periodic barriers.

In the United States, the typical patient arrives at the hospital via motor vehicle, either in a private passenger car, a taxi, or an ambulance. In many portions of the world, such means of transportation cannot be used part of the time, or even all the time. Thus, in Alaska, the territorial planning agency was guided by the following principles in delineating its hospital service areas: 2./

Excluding a small geographical area, travel to the hospital must be by air and boat in summer or by air and dog sled in the winter.

2./ Hospital Construction Plan of the Territory of Alaska,
Alaska Dept. of Health, Juneau, 1953, p. 4.

Topography and the direction of the normal flow of traffic (airplanes, rivers) determine to a large extent the boundaries of the more sparsely populated service areas.

In the Philippine Islands, the sheltered waterways are frequently used as a medium of transportation. In 1954 a number of outboard motors were distributed to outlying municipal health centers to speed the transportation of patients, personnel and supplies. 3./ The waterways are equally important in the rain forest regions of Africa; the patients brought to Dr. Schweitzer's "jungle hospital" at Lambarene, French Equatorial Africa, generally arrive by canoe. Many patients, however, have walked as many as five to six weeks merely to reach a waterway, and journeys of 500 miles for hospitalization are by no means unknown. Thus, such outpost hospitals attain the ultimate in size for hospital service areas, exceeding the small service areas of the continental United States and the larger service areas of Alaska. Needless to say, a hospital like Dr. Schweitzer's cannot provide emergency treatment for anyone but the inhabitants of the immediate vicinity. Many of Dr. Schweitzer's patients are suffering from illnesses of long duration. 4./

3./ Annual Report, Health and Sanitation Division, Philippine-American Public Health Program, International Cooperation Administration, U.S. Mission to the Philippines, Manila, 1955, p. 30.

4./ Yast, Helen, "The Settlement of 45 Roofs," Hospitals, Vol. 28, No. 5, May 1954, pp. 80-82.

In addition to population density, natural barriers, and established means of transportation, the regional hospital planner must consider the established patterns of trading and of medical care in delineating hospital service areas. Other things being constant, people prefer to go to the nearest hospital suitable for the type of illness they have. Operating upon this assumption, plus the assumption that it is undesirable to travel more than 30 miles for hospitalization, the Illinois Department of Public Health has delineated hospital service areas utilizing the bi-sector method. A number of significant cities, spaced so that at least one is within convenient driving distance of any section of the state, have been chosen as centers of service areas. The state agency has drawn lines bisecting the shortest distance between each pair of adjacent centers, producing an irregular, geometric pattern of hospital service areas. These have been modified to follow township lines, so that the population of each hospital service area may be determined. Due allowance has been made for natural barriers and established highway patterns. 5./

The resulting hospital service areas were found to conform closely with the trade area maps produced by the Department of Commerce of the University of Illinois and by

5./ Illinois Hospital Survey and Plan, Illinois Dept. of Public Health, Division of Hospital and Chronic Illness, Springfield, 1953, pp. 1,2.

the American Map Company. 6./ The same method has been employed by the Wisconsin State Board of Health; subsequent surveys have shown that the great majority of hospital admissions within each Wisconsin service area have come from within the boundaries delineated by the bi-sector method.

7./

Not all states have used the bi-sector method, modified to follow township lines, to delineate hospital service areas. The State of Georgia, for example, has preferred to use counties as the bases for its hospital service areas. Although combining counties to form hospital service areas will produce a much cruder approximation of trade and hospital service areas than the use of townships, this latter method does have an advantage in that it is easier to obtain intercensal population estimates for counties than for townships. The small size of the Georgia counties is an advantage for the planner who must work with such units.

It is not enough merely to create hospital service areas and to provide each with the number of hospital beds required to serve its needs. Hospitals, like other public service institutions, must be coordinated with each other. Coordination will prevent needless duplication of services, will provide for the transfer of complicated cases from

6./ Ibid., p. 2.

7./ Wisconsin State Hospital Plan, State Board of Health, Madison, 1954, p. 70.

small to large hospitals, and will make the personnel and services of large urban hospitals available to rural hospitals. This was first accomplished under the Bingham Plan, which has been under development in New England since 1931. This system has been so successful that the U.S. Public Health Service has required each state agency to set up a coordinated hospital system as part of the administration of the Hill-Burton Program. Such a system is defined in the following terms: 8./

Coordinated hospital system. An interrelated network of general hospitals throughout a State in which one or more base hospitals provide district hospitals and the latter in turn provide rural and other small hospitals with such services relative to diagnosis, treatment, medical research and teaching as cannot be provided by the smaller hospitals individually.

To establish a working system of this type, according to the U.S. Public Health Service regulations, the regional hospital planner must first classify the hospital service areas of his region as base, intermediate or rural areas. A base area must either (1) contain a teaching hospital, or (2) have a total population of at least 100,000 and provide a hospital, existing or planned, with at least 200 beds. If the hospital is not a teaching hospital, it must provide internships and residencies in two or more specialties. The large hospital of the base areas, with its medical training and research facilities, becomes the base hospital for the

8./ Public Health Service Regulations, Part 53, Sec. 53.1.

coordinated hospital system.

An intermediate area, to be so classified, must have a total population of at least 25,000 and must provide a hospital, existing or planned, with at least 100 beds. Such a hospital becomes a district hospital in the coordinated hospital system.

Any area not classified as an intermediate area or a base area shall be designated as a rural area. Hospitals not classified as "base" or "district" facilities constitute the "rural and other small hospitals" of the coordinated system, or, as they were termed in the original Bingham Plan, the "outpost" hospitals.

The basic operation of the coordinated plan provides that patients who require more specialized treatment than that available in the rural hospitals, or in other small hospitals, be transferred to district hospitals. When the district hospital cannot provide the services required, the patients shall be transferred to the base hospitals. Where it is not feasible to transfer patients, the personnel and services flow from the base hospitals to the district hospitals, or from the district hospitals to the remaining small hospitals. In time of emergency, patients, personnel or services may be transferred directly between the base and rural hospitals. Such a system brings, at low cost, the advantages of the large medical centers to the smaller communities.

The larger populations specified for the intermediate and base areas, as compared with the populations of the rural areas, are based upon the fact that specialized medical services are generally found in large communities. This is particularly true in the case of physicians with medical specialties.

Since patients are referred from the rural hospitals to the district hospitals, the intermediate areas must support proportionately more hospital beds than the rural areas. The base areas, in turn, must support more beds than the district areas. This situation is heightened by the fact that the hospital utilization rates of rural populations are usually low as compared with those of urban populations.

The U.S. Public Health Service, for the administration of the Hill-Burton Program, has assumed that 4.5 general hospital beds are required to serve a population of 1,000 persons, except in states of sparse population, where more beds may be required. This standard, in turn, is derived from the requirement of 4.62 beds per 1,000 population estimated by R.I. Lee and L.W. Jones in 1933. 9./ Since not all hospital service areas in a coordinated system will require the same number of beds to serve each 1,000 inhabitants, as explained above, differential bed-to-population

9./ How Many General Hospital Beds are Needed?, U.S. Department of Health, Education and Welfare, Public Health Service, 1953, pp. 9-16.

ratios have been specified by the U.S. Public Health Service for each type of area.

Base areas are assumed to require the full complement of 4.5 beds for each 1,000 population in their area. Intermediate areas are assumed to require somewhat less, or 4.0 beds per 1,000 population. Rural areas are assumed to require even fewer beds, or only 2.5 per 1,000 population.

Since the overall state need is taken to be 4.5 beds per 1,000 population, and since the intermediate and rural areas are assigned less than this number, it is clear that the total bed need for a state will be greater than the sum of the needs for the individual hospital service areas. The difference between these two totals is termed the number of pool beds; these may be assigned by the regional hospital planner to hospital service areas having specific needs for additional beds. Some of the types of hospital service areas which may require more hospital beds than their normal ratio are the following:

1. Service areas located near state lines, and which are thus serving a considerable out-of-state population as well as their local population.
2. Service areas containing hazardous industries or located on major transportation lines, and which are thus required to hospitalize victims of frequent accidents.
3. Service areas which have strong periodic fluctuations

in population, due to migrant laborers, tourists, or similar causes.

4. Service areas which are growing rapidly in population, and which are thus required to provide for future, as well as present, needs.

When a coordinated hospital system has been developed, and when the problems of special areas have been taken care of, true regional hospital planning has been accomplished. This will involve more than the mere construction of hospitals in specific local areas to meet specific local needs, a task which can be accomplished without the services of regional planners. It will involve the use of imagination and foresight, the ability to see relationships between hospitals, the desire to avoid duplication or the overbuilding of facilities, and the ability to make the most effective utilization of medical care funds and resources.

III. THE INFLUENCE OF THE PHYSICAL ENVIRONMENT UPON THE LOCATION AND SIZE OF HOSPITALS

The most obvious of the geographic influences upon the location and size of general hospitals is that of the physical environment. The term physical environment is generally understood to include those features which are provided by nature, such as climate, surface configuration, surface and underground water, and plant and animal life. For purposes of this study, it will be necessary to include certain cultural features, such as man-made lakes, within the discussion of the physical environment when such features are observed to exert influences similar to the features provided by nature.

Many types of natural barriers can impede the free movement of patients to and from a hospital. These natural barriers can be of two major types:

1. Permanent barriers, such as high mountain ranges, wide bodies of water, swamps, impenetrable forests, and the like.

2. Temporary barriers, caused by the action of weather and climate. Heavy snows and severe floods are the most important barriers found within this category.

Few portions of the earth's surface are without some

natural barriers which impede free movement to and from a hospital. Within the United States, the most ideal conditions are probably found in certain parts of the Great Plains. In Kansas, for example, the terrain is flat or gently rolling. Due to the semi-arid climate of the greater part of the state, there are no large lakes and few streams of any breadth. Thus, in developing its state hospital plan, the Kansas state agency has declared that "We have very few natural geographic boundary lines which interfere with normal transportation." 1./

However, a journey any great distance from Kansas soon encounters natural barriers of significance to the hospital planner. To the north, the seasonal snowfall increases in frequency, in depth and in duration of ground coverage until it becomes a serious problem to transport patients during the winter. To the west, there are the Rocky Mountains of Colorado, with their high and infrequent passes. To the east, streams increase in breadth and frequency; the Illinois state agency has found the presence of rivers and their attendant toll bridges to be a barrier to the free movement of people to and from hospitals. 2./

A. The Influence of Permanent Natural Barriers upon Hospital Planning

1./ Kansas State Plan for Hospital Construction, Hospital Facilities Division, Kansas State Board of Health, Topeka, 1948, p. 12.

2./ Illinois Hospital Survey and Plan, Illinois Dept. of Public Health, Springfield, 1953, pp. 1-2.

1. Mountain Barriers. Mountain ranges are among the most important of natural barriers which influence the activity of mankind. Geographers have long considered the crest of a mountain range to be the most nearly perfect type of boundary line between administrative units; it is readily determined, does not change perceptibly during the course of historical time, and it usually separates regions having different economies.

A high mountain range can act as a barrier to the movement of patients in a number of ways. First of all, passes through the mountains may be infrequent, necessitating long, circuitous journeys in order to reach a convenient way through the ridges. Secondly, the roads over the passes are usually winding and have steep grades, slowing the movement of traffic. Finally, the high altitude of the passes will make them more susceptible to blockage by snow during the colder months.

The situation is further complicated by the economic conditions encountered in mountainous areas. As a rule, mountain regions have low densities of population, a separate mountain valley may not have enough year-round population to support a hospital of efficient size. Where tourism is an important factor in the mountain economy, there will be strong seasonal fluctuations in the population, causing corresponding variations in the occupancy rate of local hospitals.

Within the United States, the problems of hospital planning in mountainous areas are most severe in the Far West. The western mountains are most frequently of the young, rugged type, and thus present formidable barriers to transportation. The greater elevation of western mountain passes makes them subject to heavier, longer lasting snows than the passes of the eastern ranges. In the Sierra Nevada ranges of California, for example, certain mountain valleys may become isolated for long periods of time. The populations of these valleys are frequently too small to support a large hospital; yet, small, emergency care facilities are not practical since the patients, after emergency treatment, cannot be transferred to hospitals in other localities.

The only procedure consistent with public safety is to build a small hospital capable of providing surgical and diagnostic services usually found only in larger hospitals. One of the best examples of this type of planning may be found in Chester, California. Located in Plumas County, in a valley of the Sierra Nevada range, Chester had a 1950 population of only 1,197. Traffic moving westward to the large cities of the irrigated Sacramento Valley must pass over Deer Creek Pass, 4,800 feet in elevation. To the north and south one finds only the mountains and valleys of the Sierra Nevada, and to the east there is the sparsely populated arid plateau of Nevada.

In addition to periodic isolation when snowfall blocks the passes leading to the west, the Chester area has the problem of seasonal variation in population due to tourism. The medical care problems of Chester have been solved in the following manner. 3./

The isolation of Chester, located in California's Sierra Nevada region, made it necessary for the 10 bed Seneca Hospital to offer complete surgical, obstetrical and diagnostic facilities not normally required in a hospital of this size. Anticipated variable occupancy further dictated that the design must allow for full operation on a minimum of personnel and expense.

Seneca Hospital meets these qualifications. A non-profit, tax supported facility owned by the state through its hospital district, it was built with Hill-Burton and state tax funds. Total construction cost was \$276,500, approximately \$33 per square foot.

The solution of the hospital problems of Chester was not accomplished without great cost. A minimum facility which offers the range of medical services expected of a larger hospital will be expensive to construct. The cost per bed of such a facility, \$27,650, was nearly double that for larger hospitals built during the same period. The higher building costs of the West Coast were not entirely responsible for this difference. The 73 bed Mercy Hospital at Redding, California, built in the same general area at the same time, cost \$1,228,000 or only \$16,822 per bed. 4./

3./ "The Thinking Behind Today's Small Hospital," Hospitals, Vol. 28, No. 3, March 1954, p. 90.

4./ Ibid., pp. 87-99.

A similar situation was faced in Modoc County, California, in the extreme northeastern part of the state. In 1950 this county had 9,678 people, enough to support a rural general hospital of at least 25 beds. Modoc County is separated, however, into two portions by a north-south range of the Sierra Nevada which reaches heights of nearly 10,000 feet. To the west of this range is Alturas, the principal population center of the county, which had a population of 2,819 in 1950. The principal center east of the range is Cedarville, which had only 750 people.

The road distance between Cedarville and Alturas is only 24 miles, but traversing this distance requires a climb to 6,352 feet at Eagle Pass. To the east of Cedarville there is an almost depopulated district of Nevada.

The communities of Cedarville and Alturas may be isolated from each other, and from the outside, for as much as three months out of the year. Therefore, the California state agency simultaneously approved two hospitals for Modoc County: one of 25 to 31 beds for Alturas, and one of 7 to 10 beds for Cedarville. The construction of both facilities was covered under one contract at a total cost of \$649,000. A portion of this cost was covered by public grants under the terms of the Hill-Burton Act. In view of the frequent isolation of both units, each provides for complete surgical, maternity and medical facilities. As in the case of the

Chester hospital, it was necessary to plan the buildings so that they could operate with a minimum of personnel and under widely varying occupancy rates. 5./

The old, worn-down mountains of the Appalachian system provide less formidable barriers to the movement of patients and medical services than the young, rugged ranges of the West. The passes over the eastern ranges are usually of lower elevation and are less subject to blockage by snowfall. Nevertheless, many Appalachian valleys are still subject to isolation during periods of adverse weather. The Chatuge Valley, in the Blue Ridge province of northeast Georgia, can be cut off from hospitals in Toccoa and Gainesville, Georgia, should a winter snowfall strike the region.

Although snowfall over the greater part of Georgia is light or inconsequential, average annual falls of five inches or more can be found in the mountainous area of the state. 6./ Due to the changeability of the winter weather in this portion of the nation, the winter snowfall can be heavy when it does occur, and may be concentrated within a short period. For example, on December 19, 1954, four to five inches of snow fell on northeast Georgia, forcing the

5./ Douglas D. Stone and Lou B. Mulloy, "One Staff Serves Two," The Modern Hospital, Vol. 76, No. 4, April, 1951, p. 76.

6./ Climate and Man, Yearbook of Agriculture, U.S. Department of Agriculture, Washington, D.C., 1941, p. 828.

state highway patrol to close portions of nine mountain highways. The highways leading in and out of the Chatuge Valley were among the roads closed by icy conditions. 7./

Such situations no longer produce medical care crises in the Chatuge Valley, since a 14 bed general hospital has been in operation at Hiawassee since February, 1952. This facility, named the Lee Mr. Happ, Jr., Memorial Hospital, was sponsored by Towns County and is the smallest complete hospital built in Georgia under the terms of the Hill-Burton Act. The hospital has been of additional benefit to the valley, in that it has enabled Towns County, which had only 4,800 inhabitants in 1950, to attract a second physician. 8./

The success of these small mountain hospitals has encouraged other states to plan for minimum-sized medical care facilities in their mountain areas. An extreme example of this is the six bed community clinic proposed for Frisco, Colorado. This community had only 87 inhabitants in 1950, and is located in Summitt County, which had a population of only 1,135. Summitt County is located in a valley between the massive Front Range and Park Range; the passes leading to other portions of the state exceed 10,000 feet in elevation.

The Colorado state agency has intended that this

7./ The Atlanta Constitution, December 20, 1954, p. 1.
 8./ Post-Audit Survey of Lee Mr. Happ, Jr. Memorial Hospital, Hiawassee, Georgia, August 8, 1953.

facility be used to hospitalize the patients of a general practitioner; more complicated medical and surgical procedures would be provided by transferring the patients, when feasible, to larger hospitals in Denver or Leadville.

9./

The influence of mountain barriers upon regional hospital planning may be summed up as follows:

a. Mountain ranges can present formidable barriers to the movement of patients, personnel and services to and from hospitals.

b. The higher the passes over the mountains, and the more rugged the topography of the ranges, the greater will be the impediment to movement. Heavy snowfalls are an important hazard of high mountain passes.

c. When a mountain valley is frequently isolated by the blockage of mountain passes, it will be necessary to make the valley a separate hospital service area.

d. Due to the sparse population of most mountainous regions, only small medical care facilities can be supported by the average mountain valley. These facilities, however, may have to be complete small hospitals, since it may not always be feasible to transfer emergency cases to regional

9./ Colorado State Plan for Hospital and Health Center Construction, 1953 Revision, State Dept. of Public Health, Denver, 1953, p. 21.

hospitals. This feature of mountain hospitals, plus the necessity of accommodating wide fluctuations in population, can make hospital planning in mountain areas an expensive proposition.

2. Water Barriers. Bodies of water may be even more effective barriers than mountains as impediments to the movement of patients to and from a hospital. The difficulties created by a water barrier will vary with its size and nature. Narrow water barriers can be bridged, but this is an expensive process and will be accomplished only at intervals. Underwater tunnels are even more expensive. Ferries are cheaper and can traverse longer distances across sheltered waterways, but their intermittent service and slow speed will hamper the rapid movement of patients to a hospital. Ship transport over broad expanses of water may be so infrequent and slow as to necessitate the use of airplanes for the emergency transport of patients.

The clearest example in American territory of the influence of large, unbridgeable bodies of water upon hospital planning may be found in the Territory of Hawaii. Administratively, the territory consists of the Hawaiian Archipelago, Palmyra Island, French Frigate Shoals, and a few scattered rock islands. For purposes of hospital planning, only six major islands of the Archipelago need to be considered: Hawaii, Molokai, Lanai, Maui, Kauai, and Oahu.

These six islands contain practically all the population of the territory; they are, however, isolated from each other by ocean channels 10 to 70 miles wide. Thus, "Each island is practically a separate geographic area as far as hospital service is concerned. One island cannot depend upon another for reasonably quick aid except by air, either to carry the patient to the needed medical care or to bring the latter to the patient." 10./

As a result of this isolation, each major island has developed its own hospital facilities to provide both general and specialized care for its inhabitants. Within each island, it is not difficult to transport patients to the hospitals. The population is concentrated near the coastline, and each island has a good road network, with major roads paralleling the coast line and with branch roads running inland or shoreward. Few villages or towns are far inland. 11./

The problem areas of the territory are those islands which do not have sufficient population to support physicians and self-contained general hospitals. These islands are Niihau and Kahoolawe. The latter is a semi-barren rock and is now used only for cattle grazing; its permanent population

10./ Report of Hospital Survey and Planning, Board of Health, Territory of Hawaii, Honolulu, 1948, pp. 39, 81.

11./ Ibid., pp. 81-82.

rarely numbers more than a few persons. Niihau, with 199 inhabitants, is a small plantation island. The people living on Niihau and Kahoolawe must depend upon other islands for hospital and medical care. The only practical way to accomplish this during emergency situations is by chartered plane, for which purpose an airstrip accommodating small planes is available at Niihau. Fortunately, chartered plane service has long been established in the Hawaiian Islands and the weather is usually favorable for flying. 12./

Sizeable inland bodies of water may have a similar, although less complete, effect upon hospital service areas. In this respect, one must not only take the effects of existing lakes into account, but also the possible effects of projected man-made lakes. An example of the latter type of situation occurred recently at Cumming, Forsyth County, a growing community of 1,264 population in north central Georgia. Cumming had been served by a small private hospital converted from an old hotel building. For specialized medical care and major surgery its inhabitants had been depending upon the 112 bed Hall County Hospital at Gainesville, 24 miles away, which had been completed in August, 1951. 13./

12./ Ibid., pp. 81-82.

13./ Survey of the Hospital and Medical Care Needs of the Cumming-Forsyth County Area, Division of Hospital Services, Georgia Dept. of Public Health, Atlanta, 1955, pp. 3-4.

In 1956 this pattern of easy medical care referral was interrupted. Buford Dam was completed across the Chattahoochee River a few miles southeast of Cumming and an artificial body of water, Lake Lanier, began to form between Gainesville and Cumming. The shortest road between the two cities, State Highway 19, became flooded where it crossed the Chattahoochee River. The only convenient alternate route was by way of State Highway No. 20 and U.S. Highway No. 23, a total of 32 miles. To make matters worse, the new route passed through a congested, built up area surrounding Buford, Georgia. The traffic of this area hindered the movement of emergency vehicles to Gainesville, Georgia.

From the standpoint of hospital planning, it is not considered desirable to have any sizeable population center more than 25 or 30 miles from a modern general hospital. The creation of Lake Lanier had thus isolated Cumming from the modern hospital facilities at Gainesville. Further, the old, makeshift proprietary hospital could not provide enough medical services to make up for the services lost through the isolation of Cumming from the larger Hall County Hospital. Therefore, in November, 1955, the Georgia state agency approved a 30 bed hospital, containing modern laboratory, X-ray, surgical and pharmaceutical facilities, for Cumming

and Forsyth County. 14./

A similar situation was believed to be developing in northeast Georgia in Hartwell, a town of 2,964 population which serves as the trading center and county seat of Hart County, population 14,495. To meet its local medical care needs, the county had been granted Hill-Burton construction funds to build a 15 bed combination maternity shelter and public health center. However, in 1955, while this facility was under construction, Hart County requested that the facility be changed to a small community hospital capable of rendering a range of medical, surgical and diagnostic services.

The reason underlying this request was the construction of Hartwell Dam across the Savannah River a few miles south of Hartwell. The lake that will eventually form behind this structure will flood U.S. Highway No. 29 between Hartwell, Georgia, and Anderson, S.C. At the present time, Hartwell depends upon Anderson, 21 miles distant, for much of its specialized medical treatment. 15./

The proposed change in the nature of the facility at Hartwell was never made, despite the imminent creation of a substantial water barrier between the two cities. An analysis

14./ Ibid., p. 9.

15./ Interview with Miss Bertha Mears, Hospital Administration Consultant, Georgia Department of Public Health, concerning conference with delegation from Hart County, Atlanta, October 28, 1955.

of the hospital care situation in northeast Georgia showed that there were two recently opened Hill-Burton hospitals to the west and south of Hartwell: the 23 bed Cobb Memorial Hospital at Royston, 11 miles distant, and the 47 bed Elberton-Elbert County Hospital at Elberton, 19 miles distant. Since these facilities were closer than Anderson, S.C., it could not be maintained that the artificial lake would create a hazardous medical care situation in Hartwell. The Hartwell facility opened as a combination public health center and maternity shelter, not as a hospital, in April, 1956.

Rivers and other bridgeable bodies of water are usually less serious impediments to the movement of patients than ocean channels and large lakes. Nevertheless, they can still exert strong influences upon the location and size of general hospitals. One of the most formidable river barriers in the United States is the Mississippi River, particularly in its broad lower course. Bridging the stream in its southern course has been further complicated by the limited public works budgets of the southern states. For example, on the section of the Mississippi River which forms the boundary between the state of Mississippi on the one hand and Arkansas and Louisiana on the other, the stream is bridged by highways at only three places: Natchez, Vicksburg and Greenville. All three of these bridges charge tolls to motorists. A ferry operates east from Helena, Arkansas, but this connects only

with an unimproved third class road in Mississippi, and thus cannot carry a significant load of traffic.

The general hospitals at Greenville, Vicksburg, and Natchez, Mississippi, receive substantial numbers of patients from the adjacent areas of Louisiana and Arkansas. 16./ Elsewhere along the river border the easy transfer of patients from state to state is not possible. Therefore, despite the limited availability of state and federal Hill-Burton construction funds, the State of Mississippi embarked upon a program of constructing a series of community hospitals within 25 miles of the Mississippi River. These facilities included hospitals at Clarksdale, with 100 beds, Port Gibson, with 25 beds, Tunica, with 25 beds, and Rolling Fork, with 23 beds. 17./

The foregoing discussion of the effect of water barriers upon the movement of patients has not considered the effect of readily bridged streams upon hospital planning. The influence of such bodies of water is usually small, although of some limited importance, and local inhabitants frequently overestimate the effect of such barriers upon hospital use patterns.

16./ Mississippi State Plan for Construction of Hospitals, 1952 Revision, Mississippi Commission on Hospital Care, Jackson, Miss., 1952, p. 1.

17./ List of Hospitals Built, Equipped and Occupied, 1946 to 1954, Mississippi Commission on Hospital Care, Jackson, Miss., 1954, pp. 1,2.

An example of this tendency to overstate the influence of small water barriers may be found in the case of Sea Island and St. Simons Island, near Brunswick, Georgia. These two islands are located immediately offshore from the Georgia mainland. Their eastern flanks face the Atlantic Ocean, but they are separated from each other and from the mainland by narrow, shallow tidal inlets. The inlets separating Sea Island from St. Simons Island and St. Simons Island from the mainland are spanned by highway bridges; the one which connects with the mainland is subject to a one-way toll.

In July, 1956, the Junior Chamber of Commerce of St. Simons Island requested that the Georgia Department of Public Health conduct a survey of the hospital and medical care needs of these two islands. The population of the islands had risen from 1,706 in 1950 to an estimated 4,000 in 1956, principally due to the booming tourist industry and the settlement of retired persons in the area. During certain tourist seasons, a transient population several times the size of the normal population lives on the islands.

18./

The islands were without medical care facilities

18./ Preliminary Statement and Survey of the Medical Needs on St. Simons Island, Atlanta, 1956, Division of Hospital Services, Georgia Department of Public Health, pp. 4-5.

other than those provided in the offices of the five local physicians. On the other hand, a careful study of the situation revealed that the medical care situation on the two islands was far from critical. The principal population center, St. Simons, is only five miles by road from Brunswick. Further, not even the fifty-cent toll need worry a motorist making an emergency trip to the mainland, since this toll is charged only to vehicles proceeding the other way. A modern 77 bed Hill-Burton hospital has been in operation at Brunswick since January, 1954, and this facility is located on the side of Brunswick which is closest to the islands. At the time of the survey, the Glynn-Brunswick Memorial Hospital was in the process of expansion to a total of 127 beds.

Obviously, the residents of the sea islands had overstated their degree of isolation from medical care facilities. The Georgia Department of Public Health recommended that the inhabitants of the islands construct a minimum-sized medical care facility, intended to provide only for emergency needs, and using only local financial resources. State and federal matching funds are not available for such minimum projects in Georgia, inasmuch as the Georgia Department of Public Health is hard pressed to obtain enough funds to construct badly needed community hospitals. 19./

From the foregoing examples, it will be seen that bodies of water can be among the most formidable natural barriers influencing general hospital planning. Those bodies of water which are broad and deep, such as oceanic channels or large lakes, present a barrier to the rapid movement of patients to a hospital, unless one is willing to resort to expensive air transport, which may be difficult to obtain. Artificial bodies of water can present barriers to the movement of patients which are just as effective as natural bodies of the same size. In fact, these barriers may present additional problems by necessitating the readjustment of local medical care patterns after the bodies of water have been created.

Bodies of water which may be bridged at occasional intervals will have a significant influence upon the hospital care patterns of areas distant from the crossings. Our large rivers fall within this category of natural barriers. Small bodies of water, such as narrow rivers and creeks will present relatively few problems to the regional hospital planner due to the ease and frequency with which they may be bridged.

B. The Influence of Climatic Factors upon Regional Hospital Planning

Conditions of weather and climate may have adverse effects upon the movement of patients to and from a hospital

and upon the satisfactory operation of such a facility. Heavy snows may place a barrier between the hospital and its patients, particularly those who live in isolated rural areas. Flood conditions may cause numerous problems. Not only might some patients be isolated from the hospital by flood waters, but the flood will create a suddenly increased demand for hospital care and may even interfere with the operation of the facility at the very time it is most needed.

The importance of snowfall as a barrier to the movement of patients will vary with altitude and latitude. The effect of heavy snows upon hospital planning at high elevations has been discussed in the foregoing section concerning mountain barriers. In non-mountainous areas, snowfalls become of greater importance as one progresses farther from the equator. As heavy winter snowfalls become more frequent, the hospital service area will have to be restricted in size, unless special means are employed to transfer patients and medical services over the snow-blanketed terrain. Since regions with severe winters do not always have enough population to support a network of closely spaced hospitals, special means of transportation are the preferred solution to this problem.

The most severe problems encountered through the effect of snowfall upon movement of patients and medical services are found in the northerly latitudes. The most

striking conditions in North America may be found in Alaska. In the greater part of the territory, the only practical means of transportation to a hospital during the winter are the airplane and the dogsled. The airlines determine, to a marked degree, the areas from which patients are drawn to hospitals. Dog sled trails were also considered by the Alaska territorial agency in the delineation of hospital service areas. 20./

Farther to the south, the Prairie Provinces of Canada also have severe climatic problems for hospital planning. Although the snowfalls of the Canadian interior are not as frequent as those of coastal areas located in the same latitude, some winter cyclones do cross the Prairie Provinces and deposit snow, which may accumulate to a depth of two to three feet. The cold, stable weather of the interior may cause this snow to remain on the ground for as long as five, or even seven, months. 21./

Faced with such conditions, the Prairie Provinces have developed two methods for the movement of patients during adverse winter weather. The first of these is the airplane. As early as 1946 the Saskatchewan Department of Public Health organized an air ambulance service based at Saskatoon.

20./ Hospital Construction Plan of the Territory of Alaska, Alaska Department of Health, Juneau, 1953, pp. 4-5.

21./ Thomas A. Blair, Climatology, New York, Prentice Hall, 1943, pp. 244-245.

Although many of the requests for this service are made during the summer, from places remote from hospitals, the majority of the requests for service are received during the winter. Ninety-five percent of the requests for service are answered; the failures to respond are usually due to poor flying weather or to the lack of suitable landing strips. 22./

In instances where it is inadvisable to move the patient, the ambulance service flies medical personnel, equipment or supplies to the patient. If no landing strip is available, supplies may be dropped by parachute. To accommodate the Air Ambulance Service and the increasing number of private aircraft, the Saskatchewan Health Survey Committee has recommended that landing strips be provided near hospitals. 23./

The second method used to transport snowbound patients to hospitals in Saskatchewan is the snowmobile. This vehicle has achieved considerable popularity for rural winter transportation, particularly for school bus service. It has become so convenient and reliable that it has frequently been pressed into service as an ambulance. 24./ One advantage of the snowmobile is that it requires no

22./ Saskatchewan Health Survey Report, Vol. I, Saskatchewan Health Survey Committee, Regina, 1951, pp. 75-76.

23./ Ibid., pp. 11, 75-76.

24./ Ibid., p. 11.

special terminal facilities like landing strips.

Flood conditions can impose as heavy restrictions as snowfall upon the operation of a hospital and the transportation of patients to the facility. Although the overflow of water from its normal channels may be caused by a number of different factors or combinations of factors, no portion of the United States is immune to such conditions. Ten inches of rainfall, concentrated within a day or two, will produce a flood anywhere, at any time, in the eastern United States. Five inches of rainfall occurring within the same period will produce the same result, provided that the ground is bare or lightly covered by snow, and that the ground is already saturated or frozen. 25./

The desert regions of the western states are likewise subject to floods. Although the average annual precipitation of the dry lands is low, when rains do come, they are apt to be of the cloudburst type. Not only will there be a great deal of water for the soil to absorb in a short period of time, but there will be relatively little vegetation to help in the absorption. A further complication is found in the fact that dry soil absorbs moisture less rapidly than moist soil. Therefore, desert floods are usually of the "flash" type.

25./ C.F. Brooks and A.H. Thiessen, "The Meteorology of Great Floods in the Eastern United States," Geographical Review, Vol. 27, No. 2, April, 1937, p. 269.

In order to be prepared for flood emergencies, a hospital should satisfy the following requirements: 26./

1. The building should be protected from high water, either through heavy retaining walls or by locating the hospital on high ground.
2. The hospital should have secure sources of electric power and water.
3. The hospital should have a small area nearby which is suitable for use as a helicopter landing field.

Where feasible, the first of these requirements should be met by locating the building on high ground, safely above the crest of even the extraordinary flood. This principle has been demonstrated frequently during recent years. During the month of August, 1955, two hurricanes struck the north-eastern United States. The second of these, depositing rain on already saturated ground, caused a series of sudden floods which were particularly severe in narrow, constricted valleys. Fortunately, the hospitals of Waterbury, Connecticut, were located on hillsides well above the swollen Naugatuck River. St. Francis Hospital, Port Jervis, New York, escaped damage from the waters of the Neversink River by being 20 feet above the crest of the flood. 27./

26./ Arnold A. Rivin, "Hospitals in the Flood Crisis," Hospitals, Vol. 29, No. 10, October, 1955, p. 173.

27./ Ibid., pp. 72-75.

A less fortunate situation existed in northern California during the flood of December, 1955. The three hospitals of Marysville and its companion town, Yuba City, were located on low ground below the tops of the river levees. On Christmas Eve the Feather River burst through the levees at Yuba City, forcing the evacuation of the 25 bed Fremont Hospital. The two hospitals of Marysville, totaling 140 beds, were evacuated as a precautionary measure; emergency hospitals were set up in a hotel and in an auditorium located above the water level. It is to the credit of the evacuation staff that these measures were accomplished with no harm to hospital patients, personnel or equipment. 28./ Yet, had the hospitals been located on high ground, this risky procedure would not have been necessary.

Locating hospital buildings on high ground will not always be practicable, particularly in broad, low-lying river basin areas. Yet, location on elevated sites will bring other advantages than safety from flooding. As mentioned above, a hospital's utilities, including water and power, must be secure from interruption. After the 1955 floods in New England, it was recommended that hospitals drill wells to insure their emergency water supplies. Such wells will be safest from contamination during flood periods

28./ "Floods Force Hospital Evacuation," Hospitals, Vol. 30, No. 2, January 16, 1956, pp. 75-76.

if they are located as far above the crest of the water as possible. The Waterbury hospitals, lacking their own wells, had to depend upon drinking water brought in by tank trucks during a portion of the crisis. 29./

Utility lines leading to the hospital will be least subject to disruption by flood if they pass from the source of power over high ground. In Waterbury, Connecticut, the local electrical power supply failed during the flood. The hospitals had emergency generators, but these ran on natural gas, the supply of which likewise failed. Power lines had to be run into the hospitals from establishments which had more secure emergency power sources. 30./

Not only must the hospital building be safe from floods, and its continued operation made secure, but some means must also be found whereby patients may be moved over flooded areas to the hospital. The helicopter is rapidly gaining popularity as an emergency rescue vehicle. The Waterbury Hospital in Waterbury, Connecticut, had a lawn and a parking lot which made satisfactory helicopter landing fields. St. Mary's Hospital, in the same community, was less fortunate and unsatisfactory, narrow streets had to be pressed into service as landing spaces. It should be noted at this point that hospital roofs should not be used as

29./ Rivin, Op. Cit., p. 75.

30./ Ibid., p. 74.

helicopter landing fields unless they have been specially reinforced for that purpose. 31./

In summary, weather and climatic conditions will pose special problems to the hospital planner. Heavy snows will cause problems in northern latitudes, but floods may become a problem almost anywhere. The hospital planner must meet these problems in the following manner:

1. Where winters are severe and accompanied by much snow and ice, either the hospital service areas must be reduced in size or special means of transportation must be provided during the winter months. In view of the sparse populations of most northerly locations, the latter solution is the more feasible of the two.

2. Hospitals should always be located above low-lying areas which might be subject to occasional flooding, and hospital utilities should be so designed that they will not be incapacitated by flood waters.

3. Whether the hazard most feared is snow or high water, the hospital should have emergency landing facilities for small planes or helicopters close to the building.

31./ Ibid., p. 173.

IV. THE INFLUENCE OF POLITICAL FACTORS UPON THE LOCATION AND SIZE OF GENERAL HOSPITALS

Not all the geographic influences upon regional hospital planning are caused by natural features. Governmental units, with their attendant political boundaries, must likewise be considered in developing a workable regional plan. Within the United States, state, county and municipal units may all present problems to the planner.

The problem of the regional hospital planner would be simplified if political divisions could be ignored. There are, unfortunately, valid reasons why state and local political units are of prime importance in the development of a general hospital system. Since World War II, the bulk of general hospital construction has been carried out under the auspices of the Hill-Burton Program. Although a federally sponsored program, this plan for hospital development is administered by agencies of the states and territories. Further, the state agencies usually do not build the hospitals themselves, but generally allocate the grants-in-aid to local sponsors who are able to qualify for matching funds under the terms of the program. Local governmental agencies, such as counties, cities, combinations of such governments, or governmentally sponsored hospital authorities, have been

the most frequent recipients of such grants. Even with federal assistance, supplemented in many instances by state funds, not many private sponsors can accumulate the local share of the capital required to build hospitals according to the rigid Hill-Burton standards. Even more important is the fact that the terms of the Hill-Burton Act require that the local sponsors provide programs of service that many non-public sponsors are unable, or unwilling, to furnish.

Therefore, no matter what the natural conditions determining the areas from which hospitals draw their patients, the construction and administration of general hospitals is very often undertaken by political units. Since the boundaries of political units and of physical regions do not always coincide, the distribution of general hospitals will be influenced by political, as well as by physiographic, considerations.

A second problem involves the disparity between the average size of hospital service areas and the average size of the political units which sponsor hospitals. A community hospital located near the center of a typical American county will, in the absence of barriers to the movement of patients, be able to serve a wider area than the county itself. An extreme example of this may be found in the instance of Georgia, which has 159 counties, more than any other state except Texas. The mean size of the Georgia counties is thus small, being only 370 square miles. A community hospital,

located in a small or medium-sized town and serving an area which is not characterized by formidable geographic barriers, can effectively serve a radius of approximately 25 road miles. In the moderately rolling topography of central Georgia, this distance will be equivalent to approximately 22 air miles, indicating that a community hospital in this state can effectively serve an area of about 1,500 square miles, or more than four typical counties.

Therefore, although a majority of the hospitals constructed under the Hill-Burton Program in Georgia have been sponsored by counties, their service areas will usually transcend county boundaries. The average Georgia county is simply too small to constitute a practical hospital service area. Similar, although less extreme, examples may be found in other states.

Where a municipality, rather than a county, becomes the sponsoring agency for a hospital, even greater problems may be encountered. In such instances, a high proportion of the hospital patients may come from outside the boundaries of the municipality. The smaller the city, the greater will be this proportion of out-of-town patients.

Within the United States, political boundaries do not present the same obstacles to the movement of patients as do natural barriers. The problems that do arise in the case of political boundaries are economic in nature. When an agency

of a government sponsors a hospital, it assumes two financial responsibilities. One of these is the original financing of the hospital building and equipment. The second is the underwriting of hospital deficits and paying for the care of indigent patients. Therefore, when one governmental unit provides hospital care for neighboring governmental units as well as for itself, it may be assuming some of the financial responsibilities of its neighbors.

At first glance the solutions to these problems would appear easy; multi-governmental hospital authorities would spread the financial responsibilities over a number of political units and could include all areas sending important numbers of patients to the hospital. Should this solution appear too unwieldy, other governmental units could form contracts with the original sponsoring body to cover such expenses as hospitalization of their indigent patients. In practice, these solutions are difficult to achieve. Local governmental agencies have traditionally viewed each other with distrust and envy; each is too well aware of its own rights and prerogatives, but too little aware of the rights of other units. Rural counties distrust urban counties; in a state dominated by rural interests, the less populous areas will be all too willing to shift their financial responsibilities to the more populous areas. Further, where two or more governmental units agree to sponsor a hospital jointly, there

can still be much argument concerning where the hospital is to be built.

State boundaries are of importance to the hospital planner in the administration of the Hill-Burton Program. Where a hospital service area crosses a state line, one state agency may have funds to construct hospital facilities for the area, but the other may have its available funds tied up in other projects. An extreme case of this has occurred in Bristol, a city which straddles the Virginia-Tennessee state line. In 1950 the Virginia portion of the city had 15,954 inhabitants, the Tennessee portion, 16,771. The combined city needed a large, centralized hospital to serve its region, but neither the Tennessee nor the Virginia state agency could build a hospital sufficient for the purpose. Finally, the Tennessee state agency approved an 80 bed facility under the terms of the Hill-Burton Program, and a local campaign raised the funds for an additional 40 beds. The building itself had to be placed in Tennessee to qualify for state-administered funds, but a site was chosen adjacent to the state line so that both parts of the city might be served. 1./

Hospital planning problems arising from county governmental units will be greatest where the geographic boundaries

1./ "The Modern Hospital of the Month, Bristol Memorial Hospital," The Modern Hospital, Vol. 77, No. 1, July, 1951, pp. 56-58.

of the county do not follow natural lines, or where the counties are too small. Some of the most natural boundary lines for counties may be found in the eastern states. In the Midwest and Far West the states were divided into counties after the advent of the "range and township" system of surveying, a system which encouraged the use of artificial, rectilinear county boundaries.

The Vermont Hospital Survey and Construction Commission has made the following observations concerning the practicality of the county boundaries of its state: 2./

Due to the geographic formation of Vermont there quite naturally appear several distinct geographic sections. Within these sections are usually located at least two, and sometimes three or four, centers of population, communities that serve as the trading centers for their section or for a certain part of their section. Our forefathers, in laying out the state, were careful to outline these geographic sections by county boundaries. The commission feels that the state hospital areas should, for the most part, follow these geographic section boundaries. Such a breakdown would allow for easy inter-section communication and travel and at the same time would keep that intra-section communication and responsibility that has been a part of Vermont for so many generations.

In order to avoid the creation of too many small hospital service areas, Vermont has been divided into five planning areas. With two minor exceptions, these have followed county boundaries.

2./ The State Plan for the Construction of Hospitals and Health Centers in Vermont, Hospital Survey and Construction Commission, Montpelier, Vermont, 1948, p. 40.

Like Vermont, most states have used counties or combinations of counties for the determination of hospital service areas for planning purposes. Limitations of time and funds usually prevent the state agencies with small staffs from conducting extensive research in order to delineate functional hospital service areas. It is also easier to obtain certain basic planning information, such as estimates of population, by county units.

The use of rectilinear county boundaries to determine hospital planning areas presents serious problems in the rugged topography of the Far West. Although the Utah state agency uses such boundaries as a matter of convenience, it is not unaware of the problems that this procedure entails, judging from the following commentary from the Utah state plan: 3./

Politically, Utah is divided into 29 counties, and parallels of latitude are used to define the northern and southern county boundaries. In consequence the county areas do not conform to trade areas, county lines often divide people living in the one [sic] valley, different rates of taxation are in effect in the same geographic region, and there may be a wide difference in the financial resources of one county as compared with another.

Problems arising from county size likewise vary from state to state. Sometimes a considerable variation in county size may be found among states in the same region. For

3./ The State Plan for the Construction of Hospitals and Health Centers in the State of Utah, State Dept. of Health, Salt Lake City, 1947, p. 1.

example, in the Southeast, the state of South Carolina is fortunate in that the mean size of its 46 counties is 675 square miles. In its state plan, the South Carolina state agency has declared each county to be a hospital service area. Where a county is not able to support a hospital of efficient size, the state agency has recommended that the county join with others to build a multi-county hospital, or build a community clinic for minor care and emergencies.

4./

Making each county a hospital service area by itself has worked well in South Carolina. The counties of that state, having a mean diameter of 29 miles, are usually large enough so that one county hospital will not fall within the service radius of other county hospitals. Further, the counties of South Carolina have become established trade areas; the inhabitants of each county generally transact their business at the main central city. Consequently, the Hill-Burton county hospitals in South Carolina have been enjoying satisfactory occupancy rates. 5./

Not all states have been as fortunate as South Carolina. With 100 counties, having a mean size of 527 square

4./ South Carolina State Plan, Hospital Construction Section, South Carolina State Board of Health, Columbia, 1954, pp. 7-8.
5./ Interview with Gaynell Hawkins, Program Representative, U.S. Public Health Service, Atlanta, January 18, 1956.

miles, North Carolina has a great many counties which are too small to constitute effective hospital service areas. The North Carolina Hospital and Medical Care Commission has recommended the creation, by legislative act, of hospital districts "incorporating two or more counties and providing some legal apportionment or assessment of the counties involved in the district for the raising of funds, both for the construction and operation of the hospital." 6./

In 1947 North Carolina had 34 counties without a general hospital. It was proposed at that time to have approximately one-third of these counties establish general hospitals to take care of their respective requirements. Another one-third were to establish hospital districts with one or more other counties, maintaining joint central hospitals, and the remaining one-third were to use hospitals in neighboring counties or to establish local facilities for emergencies and minor care. 7./

The multi-county hospital authority would, at first glance, appear to be the solution to the problem faced in Georgia, where the mean county size is only 370 square miles. This has rarely been carried out in practice. Only three hospitals sponsored by multi-county hospital authorities are

6./ Hospital and Medical Care for All Our People, Reports of Chairman and Sub-Committees of North Carolina Hospital and Medical Care Commission, 1944-45, Raleigh, 1947, p. 56.
7./ Ibid., p. 56.

in existence in Georgia, although other authorities of this type have been recommended in hospital surveys from time to time. These existing hospital authorities are:

1. The Fulton-DeKalb Hospital Authority, operating the Grady Memorial Hospital, of 1,080 beds, and the affiliated Hughes Spalding Pavilion, of 116 beds, in Atlanta.

2. The Stewart-Webster Hospital Authority, operating the Stewart-Webster Hospital, of 24 beds, at Richland, Georgia.

3. The Hospital Authority of Walker, Dade and Catoosa Counties, operating the 110 bed Tri-County Hospital at Fort Oglethorpe, Georgia.

Furthermore, one of these three multi-county hospital authorities cannot be justified from the standpoint of pooling county resources. The Fulton-DeKalb Hospital Authority is sponsored by two of the largest and wealthiest counties of the state. Each of the sponsoring counties is capable of constructing, staffing and supporting a large, efficiently sized hospital with its own resources. As a matter of fact, due to the isolation of downtown Atlanta, in Fulton County, from suburban DeKalb County, it would be better if this two-county hospital authority were dissolved and if each county supported a hospital of its own. Thus, only two multi-county hospital authorities have been formed to meet the needs of the small counties of Georgia.

One of the reasons why more multi-county hospital authorities have not been formed is that such organizations can be a source of inter-county friction. One possible source of friction is the choice of a location for the hospital, since each county may prefer to have the facility located within its own borders.

In the instance of the Tri-County Hospital at Fort Oglethorpe, Georgia, a partial attempt was made to resolve the dilemma of county location. The hospital building was erected astride the line separating Walker and Catoosa counties, satisfying the pride of two of the sponsoring counties. An unexpected problem arose during the first years of operation of this facility; birth certificates are required to list not only the usual county of residence of the mother, but also the county in which the birth actually takes place. It was discovered that the clerical staff of the Tri-County Hospital was listing the place of births as Walker County, the county in which the administrative offices were located, when actually the delivery room was located in Catoosa County.

Many of the advantages of multi-county sponsorship may be obtained without the complicated legal problems attendant to multi-governmental hospital authorities. The simplest procedure is for one county to form a contract with a neighboring county hospital to provide care for indigent patients from the county without a hospital. In the state of Georgia

indigent care is a county responsibility. If one county-sponsored hospital is burdened with unpaid bills by the indigent patients of another county, acrimonious relations between the two governments will ensue.

Such inter-county contracts, easily conceived in theory, are more difficult to achieve in practice. The 159 counties of Georgia are jealous of their own prerogatives and are reluctant to see their own funds transferred to the coffers of other counties. The situation is complicated by the traditional rivalries between the rural and urban counties. From time to time bills have been introduced into the Georgia Legislature which would require all counties to levy taxes for the hospital care of their indigent residents, whether the counties possessed hospitals or not. Since the rural counties, which control the legislature, are less apt to have hospitals than the urban counties, such bills have fared poorly.

Nevertheless, despite these jealousies, 32 counties in the state are willing to pay for the care of their indigents when the latter are hospitalized in another county. Of these 32, 15 had county-sponsored hospitals of their own but will pay for care that, of necessity, has to be furnished in another county. The remaining 17 are counties without hospitals that are willing to pay other counties

for indigent care. 8./

Another source of friction between local governments is that of admission of physicians to the medical staffs of hospitals in neighboring counties. The Macon City Hospital, for example, has been denying medical staff privileges to physicians who are not residents of Bibb County, which contains the city of Macon. Since a physician who cannot treat his patient after the latter has been hospitalized suffers a loss in both money and prestige, the physicians of Houston and Crawford counties, adjacent to Bibb County, are anxious for their local governments to sponsor county hospitals. 9./

The above factors, rivalries over the transfer of indigent care funds, local pride, and exclusive hospital staffs, will lead to the construction of more local hospitals than are necessary to serve a given area. Two or more inefficient county hospitals will be created where one large facility would be preferable.

City sponsorship of general hospitals presents even greater problems to the planner. Even if the city is capable of constructing a modern hospital facility, it will encounter problems in the operation of the hospital unless county support is enlisted, particularly in the matter of providing

8./ Indigent Hospitalization in Georgia, Report of Georgia Hospital Care Study Commission, Atlanta, 1957, p. 20.

9./ Interview with William E. Uzzell, Chief, Survey and Planning Section, Division of Hospital Services, Georgia Dept. of Public Health, Atlanta, March 5, 1956.

for indigent care. This problem is especially severe in the agricultural southern states, which have large rural populations living on low cash incomes. It is manifestly unfair to tax only the city dwellers to care for the rural indigent.

An example of the failure of a county to support a hospital sponsored by one of its cities may be found in the case of the Arlington City Hospital, Arlington, Georgia. This 16 bed facility, completed in 1951, was unable to secure a contract for indigent hospitalization from the government of Calhoun County. Had not the City of Arlington underwritten the deficit of the hospital through a local beer tax, the hospital would have been forced to cease operation. The irony of the situation lies in the fact that Arlington is situated in two counties, Calhoun and Early, and the hospital is located close to the county line. Had the facility been constructed a few yards from its present site, across the county line, support for the hospital might have been obtained from Early County. 10./

One solution to the problem of public support for city hospitals is to form joint city-county hospital authorities. Where such authorities have been formed, as at

10./ Post-Audit Survey, Arlington City Hospital, Arlington, Georgia, May 1, 1952; also, interview with Mr. William E. Uzzell, Atlanta, November 15, 1955.

Gainesville, Hall County, and at La Grange, Troup County, in Georgia, the hospitals have enjoyed sound financial backing from their two sponsors. The major objection to the creation of city-county hospital authorities lies in the ethics of taxation. The city dweller will be taxed twice to construct and operate the facility, once as a city resident, and once as a county resident. However, he will not be entitled to any more hospital privileges than the rural dweller who is taxed only once.

Minor civil divisions of counties, termed "townships" or "militia districts," are usually not considered practical units for hospital sponsorship. Their main importance to the hospital planner lies in their occasional use for the delineation of hospital service areas, as described in a previous chapter.

The problems arising from political divisions which affect regional hospital planning may be summarized as follows:

1. The boundaries of political units do not always coincide with the actual boundaries of hospital service areas. Further, many local political units are too small to be practical hospital service areas.

2. These situations will cause a hospital sponsored by one political unit to give service to residents of other political units. Thus, one government may become burdened

with responsibilities, such as indigent care, which should also be borne by the governments of adjacent units.

3. These inequities can be minimized by agreements between the governments of adjacent political units. However, traditional jealousies and local pride will often thwart plans of this nature.

V. THE INFLUENCE OF SPARSE POPULATION UPON REGIONAL HOSPITAL PLANNING

Regional hospital planning can be influenced by the distribution of population as well as by physiographic and political features. Regions of sparse population present unique problems to the planner. Some of these problems are the following:

1. In regions of sparse population, there may not be enough people living in the hospital service area to support a hospital of efficient size. Therefore, it may prove necessary to construct hospitals smaller than the desirable minimum size in order to provide all portions of the region with hospital facilities.
2. Small hospitals are proportionately more expensive to construct and operate than large hospitals. Further, since small hospitals must operate at low occupancy rates, proportionately more hospital beds must be provided to serve regions of sparse population than would be the case in other regions.
3. Where even a minimum-sized hospital or clinic cannot be supported, it will be necessary to provide special ambulance services, such as air ambulances, to move patients to areas which do have hospitals.

4. Where medium-sized hospitals can be supported in regions of sparse population, they may have to provide services and medical specialties which would normally be found only in large hospitals.

The greatest expanses of sparsely inhabited territory found in the United States are located in the western states, particularly in the deserts and the rugged mountain regions. In the eastern portion of the nation, smaller areas of sparse population may be found in regions having swamps, forests or mountains.

If the small hospital were as efficient an operating unit as the large hospital, fewer problems of hospital planning would exist for the region of sparse population. Unfortunately, this is not the case. Small hospitals are proportionately more expensive to construct and to operate than large hospitals. If a given hospital service area can be provided with satisfactory, economical care through a 100 bed hospital, it does not follow that a hospital service area with one-fifth as much population can be provided with equally satisfactory care through a 20 bed hospital. There are two reasons for this statement.

First of all, a satisfactory 20 bed hospital will cost more than one-fifth as much to construct and operate as a 100 bed hospital. The smaller facility need not provide as elaborate medical care resources as the larger one, but

at some point an irreducible minimum will be reached. The minimal laboratory and X-ray equipment for a 20 bed hospital will cost more than one-fifth as much as the corresponding equipment for the 100 bed hospital. Also, floor space allotted to certain key functions must be greater in proportion to the total floor space in the smaller hospital than in the larger, and proportionately more employees must be hired to staff the smaller facility.

The second problem encountered is related to the principle that a hospital cannot operate continuously at full capacity, but must have reserves of bed space to take care of fluctuations in occupancy. The smaller the hospital, the greater the proportion of beds which must be available to take care of sudden changes in its occupancy. Empirical studies of fluctuations in hospital occupancies were conducted prior to the publication of the Michigan Hospital Survey Report in 1946. The fluctuations in occupancy of hospitals at South Haven, Michigan, and Louisville, Kentucky, were studied for periods of two and sixteen years respectively. It was observed that the daily counts of patients in hospitals formed a normal statistical curve. The daily census of patients exceeded the annual mean by as much as three times the square root of the annual mean only seven times during each year, or approximately five percent of the time. The daily census of patients practically never exceeded the annual

mean by more than four times the square root of the annual mean. 1./

This empirical formula has been employed so often as a rule-of-thumb by hospital planners that it has become known as the "Michigan formula." It has various applications in the field of hospital planning. One application is to determine the number of hospital beds required to serve a given average daily census of patients without undue overcrowding. Conditions of overcrowding, in which more hospital beds must be set up in the facility than were planned for in the original design, are considered critical when they occur more than seven days out of the year.

If the average daily census of patients during the year is 25, a total of 45 beds will be required to serve this number of patients if undue overcrowding is to be avoided. Thus, a 45 bed hospital can be operated satisfactorily at an occupancy of 56%.

However, if the average daily census of patients rises to 36, a total of 60 beds will be required, indicating a maximum permissible occupancy rate of 60%. A 100 bed hospital can operate at 67% occupancy, and a 200 bed hospital at 75% occupancy, without experiencing undue overcrowding. Thus, as the size of the hospital increases, the required percentage

1./ Michigan Hospital Survey Report, Michigan Hospital Study Committee, A.C. Bachmeyer, M.D., Director, Lansing, 1946, pp. 171-180.

of reserve beds will decrease. Likewise, as the hospital size decreases, the lower will be the permissible occupancy rate.

Further evidence of this principle may be found in the observation that smaller hospitals do, in practice, generally operate at lower occupancy rates than larger facilities. A survey by Hospitals magazine, covering 6,956 American hospitals of varying sizes, disclosed the following differences in overall occupancy rates for the calendar year 1955:

2./

Occupancy Rates by Size of Hospital

Size Category by Number of Beds	Overall Occu- pancy Rate
Less than 25	51.3 %
25 - 49	57.6 %
50 - 99	66.0 %
100 - 199	72.4 %
200 - 299	76.9 %
300 - 499	80.4 %
500 and over	93.5 %
- - - - -	- - - - -
All Categories	85.0 %

The overall occupancy rates were determined by taking the total mean daily number of patients, for each category of hospital, during 1955 and dividing this by the total number of beds possessed by hospitals in each category.

Doubtless, more than one reason could be given to account for the differences in occupancy rates shown in the

2./ Hospitals, Vol. 30, No. 15, Part 2, August 1, 1956,
p. 22.

above table. The larger hospitals are usually found in urban areas, where the total demand for hospital service is greater. Again, many of the smaller hospitals are recent ones constructed under the Hill-Burton Program, and are thus in the process of building up their trade areas and occupancy rates. Yet, in view of the conclusions reached by the application of the Michigan formula to hospitals of varying sizes, the differences observed in the table must stem, at least in part, from the necessity of keeping hospital beds in reserve to accommodate fluctuations in the daily number of patients.

To apply the foregoing principles to the hospital planning problems of regions of sparse population, let us assume that we must provide hospital care for a population which will require 36,500 patient days of such care each year. This will maintain an average of 100 patients in hospitals for each day of the year. If the population is sufficiently clustered about a focal point, the mean daily number of 100 patients may be accommodated in one centralized hospital of 140 beds. If the population is equally spread over two hospital service areas, two hospitals of 78 beds each, or a total of 156 beds, will be required. If the population is equally extended over four hospital service areas, then four hospitals of 45 beds each, or a total of 180 beds, will be required.

The U.S. Public Health Service has recognized the need for additional hospital beds in states of sparse population by specifying higher bed-to-population ratios for such states. The U.S. Public Health Service standards in this respect are described as follows: 3./

State Allowance. The number of general hospital beds required to provide adequate hospital services to the people residing in any State shall be:

- (1) In States having 12 or more persons per square mile, 4.5 beds per thousand population;
- (2) In States having less than 12 and more than 6 persons per square mile, 5 beds per thousand population; and
- (3) In States having 6 persons or less per square mile, 5.5 beds per thousand population.

The only alternative to the provision of additional beds would be to increase the distance between hospital centers, which could eventually create a situation which is undesirable from the standpoint of public safety. Areas of sparse population are thus analogous to areas separated from hospital centers by physical barriers, except that distance becomes the agency which produces the isolation. Minimum-sized medical care facilities, often providing the same range of services that one would expect in a community hospital, may have to be provided for outlying regions. Where this is not practical, experiments have been made with the transferring of patients or services by air, a practice

3./ Public Health Service Regulations, Part 53, Pertaining to the Hospital Survey and Construction Act, as Amended, U.S. Dept. of Health, Education and Welfare, Public Health Service, Washington, 1955, Section 53.12.

similar to that recommended for Hawaii, with its water barriers, or Saskatchewan, with its winter snow barriers.

The decision faced by the regional hospital planner, whether to build a minimum-sized medical care facility or to provide special means of transferring patients and services between isolated areas and existing hospitals, is a difficult one to make. The Michigan Hospital Study Commission has recommended that there be at least 15,000 persons living within a 30 mile radius of the hospital to justify a 50 bed facility, the smallest practical unit from the standpoint of efficiency. This would require an overall population density of 5.3 persons per square mile within the hospital service area. Where such a hospital cannot be supported, as in isolated areas, emergency care could be provided through local health centers, with the proviso that the patient be transferred to a specified regional hospital as soon as practicable. 4./

The state of Michigan, however, has one of the highest overall population densities in the Union, 111.7 persons per square mile in 1950. Although much of the population of the state is concentrated in the metropolitan areas of the Southern Peninsula, only a few counties of the Northern Peninsula are sparsely inhabited. In the western states, with their broad expanses of thinly settled territory, even

air ambulance service cannot be employed satisfactorily unless hospitals of less than 50 beds are located in certain portions of the states. The California Department of Public Health, administering a hospital construction program for a huge state possessing widely varying concentrations of population within its borders, has made the following statement with respect to the support of hospitals in areas of sparse population: 5./

In isolated rural sections of low population it is recognized that small institutions are necessary to provide service within one-hour travel time of area residents. In such instances an area is established where population to be served exceeds 5,000; where population is less than 5,000, it is impossible, or at least not feasible economically, to support a hospital.

One hour's travel time by road would constitute, in the absence of critical barriers to transportation, a radius of approximately 50 miles air-line distance. Thus, the foregoing statement by the California state agency would indicate a willingness to provide minimum hospital facilities where 5,000 people were living within an area of 7,854 square miles, or where the population density falls as low as 0.6 per square mile.

Small hospital units in California have already been described in the chapter concerning physical barriers and hospital planning. In Montana, a state nearly as large as

5./ Hospitals for California, Progress Report by the State of California, Department of Public Health, San Francisco, 1953, p. 8.

California but with an overall population density of only 4.1 per square mile, the State Board of Health has likewise recommended the construction of small community clinics to serve areas of low population. Ten such clinics, of ten beds each, have been planned, to be located at Eureka, Culbertson, Broadus, Harlowtown, Big Timber, Phillipsburg, Chester, Chinook, Virginia City and Whitehall. 6./ These communities range from 323 to 2,307 in population; they may be found in both the short-grass steppe lands of eastern Montana and the forested mountains of the western part of the state. Generally, the ten communities are located at least 20 miles, and sometimes as far as 40 miles, from established hospital centers.

The Montana State Board of Health has planned that these facilities provide obstetrical and emergency care, as well as outpatient services, for their surrounding areas. They are not intended to provide the specialized equipment and services of the small California mountain hospitals. Since the State of Montana has to construct an extensive hospital network with limited funds, these community clinics must be inexpensive to construct and equip. They may, however, prove relatively expensive to operate. 7./

6./ Montana State Plan for Hospital Construction, Hospital Survey & Construction Division, State Board of Health, Helena, 1948, pp. 8-9.

7./ Ibid., p. 7.

In the Southeast, the swamp and woodland areas of the coastal regions have relatively sparse populations, although not nearly as sparse as those of the desert, steppe and woodland areas of the western states. A group of counties in the extreme southeastern portion of Georgia, Camden, Clinch, Charlton, and Echols counties, have population densities ranging from 5.9 to 11.2 persons per square mile, as opposed to the density of 58.9 for the state as a whole. In the past, these counties have relied upon private physicians' hospitals, ranging in size from five to seventeen beds, or upon hospitals in neighboring counties. These arrangements have become less desirable with the passage of time. Small proprietary hospitals, many of which are located in converted residential buildings, cannot provide the range of services available from a modern community hospital.

Two of these Georgia counties, Clinch and Camden, have applied for grants-in-aid for the construction of community hospitals under the terms of the Hill-Burton Program. Clinch County, with a 1950 population of 6,007 and a population density of only 7.5, submitted its application in 1953. The greater part of the county consists of pine forests or of swampland. Homerville, the chief population center with 1,787 inhabitants, is located 27 miles from Waycross and 34 miles from Valdosta, the nearest communities with modern hospital facilities. There are no other towns of significant

size in Clinch County.

Camden County, a forested land located along the Atlantic seaboard of Georgia, applied for construction grants in 1956. As late as 1950 this county, with a population of 7,322 and a population density of 11.2, had no definite center of population. St. Mary's, a fishing and paper manufacturing village with 1,348 inhabitants, is located on the southeastern border of the county. Woodbine, a logging center with 750 inhabitants, and Kingsland, a commercial center with 1,169, are located 15 miles inland along U.S. Highway No. 17. Most of the remainder of the population of Camden County is scattered along the paved roads of the county; few people live in the interior of the forested tracts of land.

Since the 1950 census, St. Mary's has been growing rapidly due to the expansion of its paper mill. Although a local population estimate of 2,500 inhabitants, made in 1956, may be optimistic, evidences of considerable population growth were noted during the survey of this community. Thus, the old pattern of distribution of population has become altered and a definite center of population is developing in the southeastern corner of Camden County. St. Mary's, however, is isolated from modern hospital facilities; the new hospital at Fernandina Beach, Florida, is 35 miles distant by a circuitous route. The hospitals at Brunswick,

Georgia, and Jacksonville, Florida, are even farther away.

8./

The logical answer to the hospital care problems of these two counties would be small hospitals, 18 to 20 beds in size, located in Homerville and St. Mary's. Unfortunately, at the present time the Georgia state agency does not approve construction grants for hospitals of less than 25 beds, unless special approval is granted by the State Board of Health. To avoid the delay and the possible argumentation involved in obtaining such approval, the Georgia Department of Public Health has decided to approve 25 bed community hospitals for both Clinch and Camden counties.

The 25 bed lower limit for hospital construction was based upon sound principles at the time of its formulation in 1950. Prior to that time, numerous applications had been received from small towns requesting construction funds for small community "clinics." Since many of these towns were close to larger cities, it was believed that the construction of numerous, inefficient small hospitals should be discouraged. However, the rigid application of such a regulation can lead to poor hospital planning, particularly in the instance of areas of sparse population.

8./ A Survey of Hospital and Medical Care Needs in Camden County, Georgia Dept. of Public Health, Division of Hospital Services, Atlanta, 1956, p. 4.

With the approval of two modern, albeit oversized, hospitals for Homerville and St. Mary's, few areas in Georgia remain isolated by distance from medical care facilities. Therefore, there is little need to provide special means for transferring patients from isolated areas to hospitals. In some of the western states, the situation is so different that long-range ambulance service must be provided as a substitute, or a supplement, for rural medical services.

An example of a state which must transport patients long distances to hospitals, rather than build up a series of minimum hospital facilities, is New Mexico. This is one of the most thinly populated states in the nation; its 1950 population density was only 5.6 persons per square mile. This situation was made even more severe by the highly uneven distribution of population, as 21.5% of the population was residing in Bernalillo County, which encompasses metropolitan Albuquerque. The population density of the remainder of the state is consequently reduced even further by this concentration around Albuquerque. Six counties, De Baca, Harding, Hidalgo, Lincoln, Socorro and Union, had population densities between 1.0 and 2.0 persons per square mile. One county, Catron, had an overall density of only 0.5 persons per square mile.

The New Mexico Department of Public Health has experimented with the following method of coping with sparse,

unevenly distributed population: 9./

All hospitals cannot provide all services, and some areas cannot provide even a modest range of services on a self-contained basis. An effort to provide the best possible care under a coordinated system is being tried at Grants, which has a 4 bed emergency hospital owned by a large industrial company. If possible, patients are cared for at the facility. If, however, special services or medical specialists are needed, airplane or ambulance service is provided into Albuquerque, which is 76 miles away. If the patient cannot be moved, the doctor or doctors are flown to Grants. The company does not feel complete services can be offered in the small community, but it is realized that it is necessary to offer the best possible care to the patients.

Grants, a town of only 2,251 population, is located west of Albuquerque on U.S. Highway No. 66. Despite its small size, it is the only population center of note along the 135 road miles between Albuquerque and Gallup. The economy of Grants is based, in part, upon a local sawmill which processes wood from the nearby forests. Forest and wood processing industries are among the most hazardous of occupations and require frequent hospitalizations for accident victims.

In other regions of sparse population, the State of New Mexico has also been reluctant to provide expanded medical care facilities. The extreme example of sparse population is Catron County, with only 3,533 inhabitants for its great

9./ New Mexico State Plan for Hospital Construction,
Revision No. 6, New Mexico Dept. of Public Health, Santa Fe,
1954, p. v.

expanse of 6,898 square miles. The county is largely covered by mountains and national forests, and has an economy based upon grazing, mining, and quarrying. There is no population center larger than 800 inhabitants. Only six hospital beds exist in the southern half of the county, which are located at Reserve, a community of approximately 250 persons. In view of the sparse population of the southern portion of Catron County, the New Mexico Department of Public Health believes that additional beds are unjustified at the present time. 10./

Problems of sparse population affect other places than the isolated hamlets and towns. Larger communities, located in thinly settled regions, are forced to provide more complete hospital services than would be expected in communities of their size.

An example of this principle may be found in southern Idaho, a semi-arid plateau land that has been partially developed by irrigation agriculture. At the time of the 1950 census, no metropolitan center had developed in the state. Twin Falls, a city of 17,600 inhabitants, is located in the approximate center of this region; it is 140 road miles from Boise, with 34,393 inhabitants, and 97 road miles from Pocatello, with 26,131 inhabitants. The nearest city

10./ Ibid., p. 52.

of metropolitan size, Salt Lake City, is 238 road miles distant.

Under such conditions, a city with more than 15,000 inhabitants may become a medical center. Thus, when the 142 bed Magic Valley Hospital was completed in Twin Falls in 1951, it was necessary to provide "more generous and complete" patient services than would otherwise be required in a hospital of this size. 11./

The effect of sparse population upon regional hospital planning may be summed up in the following statements:

1. Areas of sparse population may require the establishment of small, inefficiently sized hospitals in order to provide adequate coverage for the population.

2. These hospitals will not be able to operate at high occupancy rates. This will require the provision of more hospital beds to serve a given population under conditions of sparse population than under conditions of higher concentration of population.

3. Not only these small hospitals, but also larger hospitals located in areas of sparse population, will be required to provide more extensive services than would normally be required in hospitals of such size. The only alternative to this policy would be to limit the available

11./ Alan Fisher, "There's Centralized Magic in the New Magic Valley Hospital," The Modern Hospital, Vol. 76, No. 3, March, 1951, pp. 55-58.

range of services provided by hospitals in the region.

4. Where even a hospital with minimum services cannot be provided, or where only limited-care "clinics" can be supported, the available range of medical services may be expanded by providing ambulance service to larger medical centers. In the most isolated instances, only air ambulance service will be of value.

5. The principles listed above will render hospital care more expensive in areas of sparse population, unless a sacrifice in the quality of care, or in the range of services, is to be tolerated.

VI. THE PROBLEMS OF HOSPITAL PLANNING IN METROPOLITAN AREAS

In contrast to the areas of sparse population are the densely populated areas of the world. Although certain areas of Asia, such as the Szechwan Basin of China, maintain dense populations upon agricultural land, in the western world heavy concentrations of people are associated with urban modes of living. Where dense, urban populations cover significant expanses of territory, as in metropolitan areas, special problems will present themselves to the regional hospital planner.

For purposes of hospital planning, metropolitan areas may be conveniently divided into two portions. The first portion is the central city of the metropolitan area, which consists of the central business district, the contiguous zone in transition, and the oldest residential areas of the metropolitan area. This portion is characterized by heavy traffic congestion, much noise, fumes and dust, frequent industrial and commercial land uses, unpleasant vistas, and, in the innermost part of the city, high land costs. These unpleasant conditions may cause the central city to have a stable, or even declining, population.

The second portion is the suburban zone, which roughly surrounds the central city. This portion is newer, has less congestion and fewer nuisances, is more given to residential land uses, has lower land costs, and is usually considered to be a more desirable place in which to live. This desirability has caused a new set of problems to rise in the suburbs; their rapid growth has caused them to lag behind in essential public services, including the provision of hospital services. Further, as the suburbs grow, they become more and more isolated from the central city and from each other. This isolation is due in part to the outward expansion of suburbs, ever farther away from the central city, and in part to the increasing congestion of the transportation arteries leading to the central city.

These different conditions create different hospital planning problems for the suburbs and for the central cities. The two sets of problems, however, must be covered within the same overall framework, since conditions in one portion of a metropolitan area will be related to conditions within another portion.

A. Hospital Planning in the Central City

Since the densely populated metropolis has conditions differing markedly from that of the sparsely inhabited region, one problem of the latter area is not encountered. In the metropolitan area it is not necessary to construct hospitals

which are too small to be efficient operating units. Despite the heavy traffic congestion, enough population can be found within a half hour's travel time of a hospital to support a facility of efficient size.

In New York City, for example, the population is so dense that the Survey Committee of the United Hospital Fund has recommended that no more general hospitals of less than 200 beds be constructed within the city itself. 1./ In metropolitan cities of smaller size, it will not always be possible to adhere to the lower limit of 200 beds, but there should still be sufficient population within convenient travel time of each hospital to support a facility of 100 beds or more.

The problems which are encountered lie in the opposite direction. Where there are large populations concentrated within small areas, there is a temptation to construct larger and larger hospital facilities. It is true that increases in hospital size bring better patient care, a wider range of available services, a more efficient use of bed space, and a lower unit cost of patient care, but only up to a certain point. This principle, like those applying to the operation of many other public service facilities, is subject to the law of diminishing returns. Beyond a certain point, increases in the size of the hospital plant bring less than proportionate

1./ Report of the Hospital Survey for New York, presented to the Survey Committee by its Study Committee, New York, United Hospital Fund, 1937, Vol. II, p. 48.

returns in operating efficiency and the extent of services rendered. Many hospital planners go even further and state that, at some point, a hospital becomes so large that additional increases in size bring reductions in quality and efficiency of care.

The reasons for this decrease in efficiency and in quality of care are numerous. For one thing, administrative procedures become impersonal and cumbersome, and more efforts must be made to coordinate the departments of the hospital. Service for the patient becomes less prompt, and the hospital may require more personnel per patient to maintain satisfactory standards of treatment and care. Savings in the utilization of costly equipment will no longer appear with each increase in size, since at some point even the largest pieces of equipment will become overtaxed and duplicate equipment must be ordered.

The Italian hospital architect, B. Franco Moretti, sums up the problems of great urban hospitals in the following words: 2./

The "hospital cities" with more than 1,500 beds appear inadvisable because of the excessive bureaucratization that arises through the difficulty of economic controls upon consumption, through the ineptness of services, through the excessive division of skills, responsibilities and working rules, through the hygienic problems, through the limitation upon

2./ B. Franco Moretti, Ospedali, Third Edition, U. Hoepli, Milano, 1951, p. 12. (Author's translation.)

autonomy and upon the possibilities of development of individual initiative, and through the greater external influences of administrative and political nature, etc., that interfere with and ensnare the conduct of affairs.

Many architects and regional hospital planners believe that the limit upon hospital size should be placed far lower than the 1,500 beds mentioned by Moretti. The Report of the Hospital Survey for New York, published in 1937, questioned the ability of one man to administrate a hospital with more than 800 beds. 3./ The Michigan Hospital Survey Report places the upper limit for efficient size at a similar level, or 750 beds. 4./ Gustav Birch-Lindgren, the Swedish hospital architect, places the desirable maximum size even lower at 500 beds. 5./ The State of Illinois, in its state hospital plan, would also place the upper size limit for general hospitals at 500 beds, except in the case of teaching hospitals. 6./

From the foregoing it would appear that one goal of hospital planning for metropolitan central cities would be to construct a network of hospitals, preferably between 200 and 500 beds in size, and not less than 100 beds or more

3./ Report of the Hospital Survey for New York, p. 324.

4./ Michigan Hospital Survey Report, pp. 58-59.

5./ Gustav Birch-Lindgren, Modern Hospital Planning in Sweden and Other Countries, Medens Forlags, Stockholm, 1951, pp. 104-106.

6./ Illinois Hospital Survey and Plan, Illinois Dept. of Public Health, Springfield, 1953, pp. 3-4.

than 1,000 beds in size. There remain, of course, other planning goals than the determination of optimum hospital size. A second problem is that of urban blight and the changing nature of urban neighborhoods. Residential neighborhoods, with their pleasant vistas and their quietness, are the most desirable neighborhoods for general hospitals. Many of the downtown hospitals of our larger cities were originally established in the residential areas close to the central business district, and were thus convenient to both the residential population and to the people who worked in the city center.

The steady growth of a metropolis will cause the central business district to expand. In front of this expanding commercial zone, a blighted zone in transition will spread across former residential areas. Hospitals are slow to change their locations and consequently many have been engulfed by these spreading waves of blight and commercial activity. A hospital, located in an attractive area yesterday, may find itself in a depressed area today and in a business area tomorrow. Formerly pleasant urban vistas will be replaced by drab and depressing ones; street and neighborhood noises will increase. The traffic situation will deteriorate until patients, staff members and visitors find it difficult to reach the old hospital site, and to find adequate parking space upon arrival if they travel by

car. At some point the hospital management, staff and patients will be faced with the realization that their facility has a problem in its location.

It might be assumed that these problems of location are of comparatively recent origin. Nevertheless, in highly urbanized England there has been an awareness of these issues for nearly half a century. In 1910, Sir Henry Burdett, writing in the Eleventh Edition of the Encyclopedia Britannica, discussed some of these very same problems.

Burdett, a British hospital administrator and a frequent writer on hospital topics, recommended that hospitals be located where they could obtain fresh pure air, sunlight, and room for any necessary expansions. In order to obtain these goals, and to isolate the hospital from neighborhood nuisances, Burdett recommended a "sanitary zone" between the hospital and nearby buildings. The breadth of this zone should never be less than twice the height of the nearest building. For the emotional well-being of the patients, Burdett recommended that the hospital have a "cheerful, sunny aspect." 7./

The achievement of these goals can be blocked by more than the dust, noise, smoke and traffic of the great city. The ample, pleasantly landscaped site recommended by Burdett

7./ Sir Henry Burdett, "Hospital," The Encyclopedia Britannica, Eleventh Edition, Vol. XIII, pp. 797-798.

is difficult to achieve where the land values are high, as in the heart of the central city. Even when the hospital has been built surrounded by an ample plot of ground, the rising land values will eventually cause nearby buildings to be built of multi-story construction, shutting out sunlight and pleasant vistas from the hospital. Further, if the hospital plans to expand, the high cost of land may force construction upon the open portions of the hospital site, increasing the problem.

In Atlanta, many of the centralized general hospitals were established in residential neighborhoods, but the passage of time has changed the nature of their surroundings. St. Joseph's Infirmary, located north of the city center at the edge of the expanding business district, fronts on Ivy Street. This thoroughfare handles much of the commuter traffic between northeast Atlanta and the heart of the city, including trolley busses as well as passenger vehicles. Looking westward across Ivy Street, patients in the new wing of St. Joseph's Infirmary will see a drab line of commercial buildings.

Georgia Baptist Hospital, located farther from the city center of Atlanta in an old part of the northeast quadrant, is no better off. The once attractive residential district surrounding the hospital is deteriorating as it is engulfed by the zone in transition. Frontage on Parkway

Drive, one of the adjacent streets, is gradually being rezoned for commercial uses. The new addition to the hospital faces Boulevard, a major north-south traffic artery of eastern Atlanta. The north end of the site is bounded by Forrest Avenue, another important traffic artery. Both Boulevard and Forrest Avenue, like Ivy Street, have trolley bus lines.

These sites of Atlanta hospitals, poor as they are, are still superior to those of many hospitals in larger cities. Many of the hospitals in Manhattan Island, the center of New York City, are located in noisy, congested areas. Street traffic, subway lines and commercial activities contribute to the high noise level, and nearby tall buildings shut out sunlight. If residential slums are close by, the effect upon the patients' well-being can be particularly deleterious. Harlem Hospital, for example, is located on a crowded site, across from a residential slum of the Harlem district. Both the hospital and the apartments are tall enough, and close enough to the street, to limit the amount of light and air reaching the hospital and the residences. 8./

Solving problems raised by such hospital sites is not an easy task. Given some leeway, the architect or planner can devise a compromise solution which will ameliorate

8./ Isadore Rosenfield, Hospitals, Integrated Design, Second Edition, New York, Reinhold Pub. Corp., 1951, p. 31

the effects of the urban environment. Placing the hospital upon a large block of land will partially isolate the hospital from the nuisances of the city, and will permit some landscaping of the immediate environment. The extremely high cost of land is the usual stumbling block to such plans. Another possible solution is the utilization of whatever scenic features exist in the downtown environment. The Francis Delafield Hospital in New York had to be placed on a narrow site which faced a solid row of six story apartment houses along one side. Fortunately, the other side of the site faced the Hudson River. The building was given an unusual orientation on its site, permitting the patient rooms to face the river and sparing the patients a view of the wall of apartments. 9./

Industrial and commercial activities can bring more than discomfort or annoyances to the patients. They can be a danger to the safety of hospitals, particularly if the hospitals are concentrated in one location. Clement C. Clay, Director of the School of Hospital Administration, Yale University School of Medicine, has stated: 10./

In one city in the Midwest, a large proportion of the voluntary, non-profit hospital beds are

9./ Ibid., p. 33.

10./ Clement C. Clay, "Consider the Possibilities of Decentralizing Hospitals to Minimize the Hazards of War, Nature and Traffic," The Modern Hospital, Vol. 70, No. 2, Feb., 1948, pp. 58-59.

located in institutions in a small area through which a busy railroad freight line passes in an undercut. The explosion of a tank car in the right place at the right time would decimate the region and leave that city virtually without hospital facilities for a large segment of the population.

Clay uses the Texas City disaster of April, 1947, as proof that such disastrous explosions can occur in conjunction with transportation facilities.

The implications of military defense can be even more serious than those of defense against civilian disasters. Here again, the overconcentration of hospital beds in the downtown areas of great cities can become a liability. Our metropolitan areas will become prime targets in the event of war; the centers of these areas, with their railroad yards and terminals, their business and governmental buildings, and their centers of communication, will, in turn, be the most vital targets within the metropolitan areas.

A fifty X hydrogen bomb, exploded at the center of Atlanta, would destroy Piedmont, Grady, St. Joseph's, Georgia Baptist and Crawford W. Long hospitals, which contain most of the hospital beds in the Atlanta metropolitan area. The Emory University Hospital, located in suburban DeKalb County, would be seriously damaged, limiting its use. ll./

ll./ Letter to Dr. R.C. Williams, Director, Division of Hospital Services, Georgia Department of Public Health, from Mr. Elliot R. Jackson, Director, The Atlanta Metropolitan Area of Civil Defense, October 13, 1955.

Such a danger from overconcentration of hospital beds has existed in other great cities. In 1953, Dr. John W. Cronin, Chief of the Division of Hospital Facilities, U.S. Public Health Service, analyzed the effect of a military attack upon the heart of Pittsburgh, Pennsylvania. The 8,125 general hospital beds then existing in the Pittsburgh area would be reduced to approximately 4,000 were such a disaster to strike. 12./

Yet another undesirable effect of maintaining extensive hospital facilities in their old locations near the central business district of a great city results from the declining residential population of the center of the metropolitan area. As the business district expands, residential land uses become replaced by commercial and industrial uses. In many metropolitan areas, where the central city has not expanded its corporate limits, the population of the central city has been declining while the population of the total metropolitan area has continued to increase.

Examples of central cities which declined in population between 1940 and 1950, while the populations of their metropolitan areas were increasing, are Jersey City, N.J., Providence, R.I., Paterson, N.J., Fall River, Mass., Wilmington,

12./ John W. Cronin, M.D., "Locations of Hospitals in Respect to Target Areas," The Military Surgeon, Vol. 112, No. 4, April, 1953, pp. 236-242.

Del., Reading, Pa., New Bedford, Mass., and Charleston, S.C. Other central cities have already undergone their period of greatest growth and remained virtually stationary in population between 1930 and 1950; examples are Philadelphia, Pa., Cleveland, Ohio, Pittsburgh, Pa., Buffalo, N.Y., Rochester, N.Y., and Worcester, Mass. The next census may show a decline in population for some of these stationary cities, unless their corporate limits are extended to include the growing suburbs.

According to a special population count conducted by the United States Bureau of the Census in April, 1957, the largest central city of all, New York, has already passed the "plateau" stage. The 1957 count was 7,795,471, which was 1.2% less than the official count of 7,891,957 for April, 1950. The total metropolitan population of New York City continued to grow during this eight year period, from 12,911,994 to 14,066,000. 13./ This shift in population has had an effect upon the pattern of demand for hospital service in Greater New York. According to a survey conducted in 1955, the suburban hospitals were more crowded than those in New York City proper. This was especially true in the instance of maternity care, due to the high birth rate caused by the young families of the suburban areas. 14./

13./ The New York Times, October 9, 1957, pp. 1, 27.
14./ The New York Times, December 5, 1955, pp. 1, 18.

The city of Atlanta may face a situation similar to that of New York in its future development. Between 1940 and 1950 the increase for the city as a whole was only 9.6%, as opposed to 143.2% for the metropolitan area outside the city limits. Further, the portions of the city proper which showed the greatest rates of increase were those close to the city limits. Yet at the beginning of 1957, 85.3% of the hospital beds of the metropolitan area, excluding those in unsafe or outmoded buildings, were within the city limits of Atlanta. 15./

The provision of hospital beds for the central cities of metropolitan areas is thus largely a problem of reaching, and maintaining, an optimum concentration of beds. Contrary to the experience of rural areas or areas of sparse population, the great city is as likely to have too many beds as too few; the passage of time and the increasing commercialization of the city center will increase the probability of an oversupply of beds.

One solution for this problem involves the gradual elimination of the older hospitals of the central city as their plants become unsafe or obsolete. The hospital organization and staff may be re-established in a different location

15./ Survey of the Need for Suburban Hospital Service in the Atlanta Metropolitan Area, Division of Hospital Services, Georgia Department of Public Health, Atlanta, 1957, pp. 11, 15.

within the metropolitan area, such as in the rapidly growing suburbs. A half century ago, Burdett recommended against the rebuilding of hospitals in the downtown area, where land and building costs are high. Instead, he suggested that the downtown hospitals move away from the city center, maintaining only a "receiving house" in town. 16./

In view of the fact that not all of the population will leave the central city, and that a considerable commercial and industrial population will be in the center of town during working hours, such an extreme solution may not prove to be desirable. The redevelopment of downtown slum areas may actually increase the population of a portion of the central city. Attractive redevelopment can be financed only by increasing the concentration of population through multi-story construction. In any event, some hospital beds must be maintained in the downtown area to accommodate the remaining residents and commuters to the city center.

In the event that more hospital beds remain in the downtown area, even after the elimination of obsolete facilities, than are required to serve the downtown population, a second solution to the problem may be attempted. Rather than tear down sound, efficient hospital plants which are good for many more years of service, the hospital planner

16./ Burdett, Op. Cit., p. 797.

may suggest that the surplus hospital beds be devoted to specialized medical care. Large cities lend themselves well to the development of medical specialties since personnel and services required for such specialization are more likely to be found in the metropolis.

An example of this solution is being tried in Savannah, Georgia, which had a metropolitan population of 151,481 in 1950. In order to meet the demand for modern hospital services, the 300 bed Memorial Hospital of Chatham County was completed in October, 1955, in the growing residential district of the southern part of the city. The six older hospitals of Savannah, ranging in size from 50 to 171 beds and concentrated in an older, semi-residential district nearer to the city center, were faced with the prospect of declining occupancy rates due to their older plants and their less attractive, less convenient locations.

As a solution to this problem, the Georgia state agency has recommended that these older hospitals develop medical specialties and build up a medical trade in the form of referrals from other hospitals. A psychiatric unit for St. Joseph's Hospital and the eventual conversion of the 75 bed Telfair Hospital into a facility for chronic patients are part of this plan. 17./

17./ Survey for a Psychiatric Hospital Facility in Savannah, Georgia, Division of Hospital Services, Georgia Department of Public Health, Atlanta, 1956, pp. 7-9.

Remaining downtown hospitals, even if physically sound, will still have the problem of unpleasant environments. The city is not without resources to meet this problem. For example residential neighborhoods have been improved by the creation of "super blocks," in which a number of blocks are combined and interior through streets eliminated. This gives the planner a large unit with which to work, and permits more flexibility in the provision of open space around the residential buildings. Similar techniques can be used for hospitals. Rosenfield has recommended the use of two city blocks for the construction of a hospital as large as 500 beds, with the elimination of the interior street between the two blocks. In New York City the average site would thus be 450 to 460 feet wide, and 600 to 800 feet long, and would vary between six and nine acres in area. This much land would permit the hospital to be set back from the streets, improving the lighting of the building and providing a degree of isolation from traffic. 18./

Improvements of hospital sites should be coordinated with other urban redevelopment activities. Plans for the redevelopment of residential areas are usually based upon the neighborhood unit, a planning unit comprising 3,000 to 12,000 persons and centered about such basic facilities as

18./ Rosenfield, Op. Cit., p. 31.

an elementary school, a playground and a shopping center. It will readily be seen that even the largest neighborhood unit cannot support a hospital of 100 or more beds, and that most cannot support hospitals of even 50 beds. Some planners, such as Jose Sert, have recommended an emergency clinic for each neighborhood unit. 19./

In order to support more extensive facilities, such as junior and senior high schools, cultural centers, and the like, it has been proposed that six to eight neighborhood units be integrated into larger planning units. Jose Sert believes that six to eight such units would have a total of between 56,000 and 80,000 inhabitants. 20./ This would constitute sufficient population to support an efficient urban hospital of between 140 and 178 beds. The inclusion of hospitals into plans for urban redevelopment should be the long term goal of the hospital planner working in urban areas; until such integration of medical, educational, cultural and residential facilities has been accomplished, the best plans for the rehabilitation of hospital sites will be but patchwork affairs.

B. Hospital Planning in the Suburban Areas

Contrasting with the old, congested downtown areas of our large cities are the new and expanding suburban areas.

19./ Arthur B. Gallion, The Urban Pattern, New York, Van Nostrand Company, Inc., 1950, p. 289.

20./ Ibid., p. 289.

At first, the suburban areas relied upon the hospitals of the older downtown areas for medical care. With the passage of time, such arrangements became less desirable, due to the following reasons:

1. The environment of the downtown hospitals steadily deteriorated due to the changes taking place in the central city.
2. Transportation to the downtown hospitals from the suburbs became slower, more arduous and, in some instances, more dangerous.
3. The suburbs grew to the size where they could support their own hospitals.

The deterioration of the downtown environment has been covered in the previous section. The increasing congestion of the transportation arteries leading into the central city is thus our next concern.

The most common mode of transportation to a hospital is via motor vehicle, either by ambulance, taxi, or private automobile. Non-emergency patients do travel to hospitals via railroad or rapid transit lines, and the helicopter has been pressed into service as an ambulance when its services were available, and when landing space was available near the hospital. Yet, for the foreseeable future, the motor vehicle will remain the commonly available means of emergency transport and the congestion of roads and streets will thus

be the main transportation problem affecting metropolitan hospital planning.

In metropolitan Atlanta it has already become difficult to reach the downtown hospitals from the suburbs and the outlying areas. Grady Memorial Hospital, the large public facility operated by Fulton and DeKalb counties in metropolitan Atlanta, is located not far from Five Points, the commercial center of Atlanta. As a public hospital, it must handle not only the bulk of the indigent patients of Fulton and DeKalb counties, but also the emergency cases arising from accidents, assaults and sudden illness. Yet, the location of this facility, only six-tenths of a mile from Five Points, is not convenient to the outlying portions of its sponsoring counties. The difficulty of reaching Grady, even by emergency vehicles, increases as one encounters the steadily thickening traffic of the heart of Atlanta. An interesting example of the hazards of such a journey occurred in October, 1955. Two men were injured in an automobile accident in northern DeKalb County. While they were being rushed to Grady Hospital, they were involved in a second accident, in which four more persons were injured. Although this second accident occurred close to a private medical clinic, all six victims had to be taken to Grady Hospital because the clinic was not operating on a 24-hour basis and

the second accident occurred after closing hours. 21./

Such double accidents are not a frequent occurrence, but even presumably normal trips from the suburbs to Grady Hospital are not without their hazards. The ambulance trip from Alpharetta, in northernmost Fulton County, occupies 27 miles of travel each way. 22./

The non-public hospitals of metropolitan Atlanta are, with few important exceptions, clustered in the same downtown area which contains Grady Hospital. Eight general hospitals, with a total of 2,586 beds, are located within a two and one-half mile radius from Five Points. Yet, outlying portions of Fulton and DeKalb counties may be more than 25 miles from the center of Atlanta.

Physicians, as well as patients, residing in the suburbs find the travel time to the non-public downtown hospitals inconvenient. In January of 1956, the Division of Hospital Services, Georgia Department of Public Health, distributed questionnaires to physicians living in north Fulton County, south Fulton County, Clayton County and DeKalb County, i.e., outlying portions of the Atlanta metropolitan area. Replies were obtained from 61 physicians. They reported making a mean of 8.7 trips per week to Atlanta

21./ North DeKalb Record and Norcross News, Norcross, Georgia, October 20, 1955, p. 1.

22./ Testimony of Mr. Louis Jones, Funeral Director and Ambulance Operator, at Alpharetta, Georgia, January 18, 1956.

hospitals, and spent a mean of one hour, twenty-eight minutes of travel time on each round trip to these hospitals. South Fulton County physicians, who spent an average of one hour and forty-five minutes on each round trip, were the most isolated of any of these suburban medical groups.

23./

On a one-way basis, the travel time between the downtown Atlanta hospitals and the suburban physicians' offices would amount to an average of forty-five minutes. This is nearly half again as much as the one-half hour's travel time generally accepted as the upper limit between the community hospital and the limits of the hospital service area.

The same problems have been encountered in other metropolitan areas. The hospitals of downtown Macon must supply medical care for most of the Macon metropolitan area. This has involved more and more inconvenience for the inhabitants of the outlying regions as traffic conditions in downtown Macon have deteriorated. For example, residents of Roberta, in Crawford County, must drive 25 miles to the hospitals in downtown Macon. In non-metropolitan situations, Roberta would be within a half hour's drive of the Macon hospitals, and would thus be just within the effective limit

23./ Survey of the Need for Suburban Hospital Service in the Atlanta Metropolitan Area, Division of Hospital Services, Georgia Dept. of Public Health, Atlanta, 1957, pp. 36-37.

of the Macon hospital service area. The great difficulty encountered in practice is not the 23-mile drive to the city limits of Macon, but the remaining journey of approximately two miles from the city limits to the downtown hospitals. The latter portion of the trip occupies nearly twice as much time as the previous 23 miles. 24./

Bad as these traffic conditions are, they would not be considered unusual in the metropolitan areas of California. The metropolitan areas of the Far West, like those of the Southeast, have experienced their greatest growth during the automobile age. The Department of Public Health of the State of California has recognized the problems caused by increasing traffic congestion in its metropolitan areas; it has thus recommended that "metropolitan regions" be divided into a number of hospital service areas "which combine within reasonable distance and travel time of the established centers within the region." 25./ Since each hospital service area has, for planning purposes, a separate priority for receiving hospital construction grants, such division of metropolitan areas into numerous hospital service areas would encourage the construction of suburban

24./ Interview with Mr. William E. Uzzell, Chief, Survey and Planning Section, Georgia Dept. of Public Health, March 5, 1956, relative to a conference attended at Roberta, Ga., March 2, 1956.

25./ Hospitals for California, Progress Report by State of California Dept. of Public Health, San Francisco, 1953, p. 8.

hospitals. The older downtown areas are already well supplied with beds.

In practice, the California Department of Public Health has divided the metropolitan area of San Diego into five hospital service areas, that of San Francisco into eleven, that of Los Angeles into twenty. The centers of several of the Los Angeles areas are less than ten miles from downtown Los Angeles, giving an indication of the slowness of traffic movement within the metropolitan area. 26./

This decision of the California state agency is of unusual interest because of the extensive efforts that California has spent upon urban freeways. These multi-laned, limited access highways, also referred to as expressways, have been hailed as remedies for the traffic bottlenecks of large urban areas. Metropolitan Atlanta, for example, has long been engaged in the construction and planning of an expressway system. It has been hoped that this system, when completed, will permit the downtown hospitals of Atlanta to serve the outlying portions of Fulton and DeKalb counties in the metropolitan area. The Metropolitan Planning Commission of Atlanta, in its 1953 survey of hospital needs, made the following statement concerning the accessibility of

26./ Ibid., pp. 18-19.

the proposed new Grady Hospital: 27./

An additional accessibility factor is the location of the Central Expressway which will pass within a few yards of the site of Grady Hospital. Within a year or so the most thickly populated portions of south Fulton County will be within a few minutes travel time of Grady.

In actuality, the situation has proved to be less optimistic. In January, 1958, the new Grady Hospital, of 1,080 beds, was opened for service. Yet, the closest approach of the expressway was still more than a mile from the new Grady Hospital, and construction was proceeding at a painfully slow pace.

Even the completion of an expressway will not solve the medical care problems of suburban areas which are dependent upon downtown hospitals for medical care. In the opinion of many traffic engineers, limited access urban freeways raise nearly as many problems as they solve. One such opinion is quoted below: 28./

The harder we try, and the more we spend--on widening streets originally built for horse and buggy traffic, and on demolishing buildings to make way for parking, and on constructing expressways and freeways to make it easier to drive downtown--the worse our traffic congestion becomes. These steps serve to attract still more automobiles to the central business district. Our experience shows that what we have been doing is like running on a gigantic treadmill.

27./ A Brief Study of the Supply of and Need for General Care Hospital Beds in Fulton and DeKalb Counties, Metropolitan Planning Commission, Atlanta, 1954, pp. 23-24.

28./ Donald C. Eye, Harold F. Hammond and Wilbur S. Smith, "What's Happening Downtown," Traffic Engineering, Vol. 25, No. 5, February, 1955, p. 183.

A prime example of this "gigantic treadmill" may be found in metropolitan Los Angeles, where a number of freeway projects have been completed. Robert S. Henderson, of the City Street and Freeway Division of Los Angeles, has made the following observation: 29./

Since the completion of the studies of the four freeways (Ventura, Venice, Industrial and Golden State) described, traffic counts on existing freeways have continued to soar. Counts on the Hollywood Freeway in excess of 180,000 vehicles per day have been made, although 90,000 vehicles per day was [sic] assumed during design. Until further freeways are built, one accident or disabled vehicle may disrupt the operation of an entire freeway. Such overloads and disruptions are reducing the hoped for advantages of motor vehicle operation on the Los Angeles freeways.

The observations quoted above should lead us to understand why, despite the continued construction of urban freeways, suburban areas remain isolated from downtown districts, and why the California state agency has facilitated the construction of suburban hospitals.

Questions might be raised concerning the ability of suburban areas to support hospitals of efficient size. The growing populations of our suburbs are usually sufficient to support hospitals which are large enough to secure operating efficiency and breadth of services. According to the U.S. Public Health Service ratios, urban populations with

29./ Robert S. Henderson, "Freeway System of Benefits," Traffic Engineering, Vol. 26, No. 6, March, 1956, p. 256.

high incomes should have approximately four beds to serve each 1,000 persons. Thus, a 50 bed hospital, the smallest economical unit, can be supported by a suburban population of 12,500 persons. A 100 bed hospital, large enough to provide most of the services expected of a general hospital, can be supported by 25,000 persons. Yet, the danger of building hospitals of inefficient size can exist in the suburb as well as in the central city. When a suburban district passes the 125,000 population mark, more than 500 beds can be supported and it may become desirable to plan for a second hospital.

Even if the population of a suburb is not large enough to justify an efficient facility, the hospital planner may recommend a smaller unit capable of handling local needs, but designed for expansion to a more efficient size as the population of the suburb increases. In fact, this rapid rate of growth of suburban populations, and the necessity of expanding hospital plants to keep pace with the growth, may become a problem for the planner.

The expansion of a hospital plant can be an easy or a difficult task, depending upon the foresight of the founders of the hospital. First of all, ample land must be available for the enlarged building and for such auxiliary needs as parking lots, landscaping, and the like. Where sufficient land has not been reserved for this purpose, expansion can

be a costly matter. As suburbs grow, land values rise; further, the adjacent land is more likely to be occupied by buildings, necessitating greater costs of land acquisition.

One instance where sufficient land, not only for expansion but also for maintaining desirable site conditions, has been obtained for a hospital may be found in northern California. Sequoia Hospital, a 100 bed facility located at Redwood City, California, was completed in 1950 to serve a district containing several of the residential communities of the San Francisco peninsula. The population of this area had doubled between 1940 and 1950, and was still showing an upward trend at the time the facility was constructed. Therefore, the hospital was planned for expansion to a possible 200 beds. In order to obtain ample land, a site was chosen which was central to the communities to be served, and no fewer than twelve acres of land were obtained. This reserve land will permit the hospital, even if expanded, to remain well back on the site to avoid the increasing traffic. 30./

Another caution to be followed by planners of suburban hospitals is to design the hospital building itself for expansion. It is comparatively easy to increase the number of beds

30./ Douglas D. Stone, Lou B. Mulloy, Silvio P. Marraccini and Max E. Green, "Simplicity at Sequoia," The Modern Hospital, Vol. 74, No. 3, March, 1950, pp. 68-71.

by adding bedroom units to a hospital. What may prove more difficult is to enlarge the central core of the building, containing the administrative, dietary, surgical, laboratory, storage and heating facilities, particularly when this central core is nearly surrounded by bedroom units. The expansion of the central service area can thus involve knocking out walls, moving heavy equipment, and other major alterations to the building. It is preferable, if much expansion is anticipated, to design the central service core large enough to serve the hospital that will eventually be needed. This will raise the initial cost of the building, but will result in an eventual saving in costs.

An example of such foresight in planning may be found in the 215 bed Oakwood Hospital, completed at Dearborn, Michigan, in 1951. The Greater Detroit Hospital Fund, after a survey of the needs of its metropolitan area, decided to construct a suburban hospital at Dearborn, 12 miles from the center of Detroit. In view of the rapid growth of Dearborn, which increased by 49% between 1940 and 1950, the hospital was constructed for eventual expansion to 450 beds. As a result of this generous provision of central services, the cost of the original building, including equipment, was \$5,000,000. This amounts to a unit cost of \$21,550 per hospital bed; however, due to the ease with which expansion may be accomplished, the cost of the completed 450 bed hospital

would be \$6,750,000 at the 1951 price level, or only \$15,000 per bed. 31./

An example of failure to plan for substantial and rapid expansions of a suburban hospital may be found in the instance of Kennestone Hospital, Marietta, Georgia. Cobb County, of which Marietta is the principal city, is near Atlanta and has had a phenomenal rate of growth; its population, which was only 38,272 in 1940, had risen to 61,830 by 1950. Nevertheless, only 101 beds were provided for the hospital at the time of its opening in 1950, and there were even doubts concerning the success of the hospital.

The doubts were quickly dispelled. By 1952, the occupancy rate of the hospital had become so high that the management had to set up 114 beds in a building designed for 101; even the solariums had to be used as bed wards.

32./ At times, as many as 128 patients were cared for within the building; this was accomplished by putting more beds in the bedrooms than the number specified in the original design.

Therefore, an additional bed unit for Kennestone Hospital was completed in February, 1955, raising the normal bed capacity to 151. It was hoped, at the time this addition was planned, that this additional bed space would be sufficient

31./ H. F. Stanton, "Oakwood Hospital Plans to Grow," The Modern Hospital, Vol. 77, No. 3, Sept., 1951, pp. 59-62.

32./ Post-Audit Survey of Kennestone Hospital, Dec. 29, 1952.

for years to come. Unfortunately, by 1955 the population of Cobb County had risen to an estimated 77,100. Shortly after the new section had been placed into service, a day arrived when every bed in the new section was filled. 33./ The solariums were again placed into service as bed wards, and a recovery room was turned into a patient bedroom. On the afternoon of January 13, 1956, the census of patients reached an all-time high of 165. 34./ Serious discussion of a second 50 bed addition resulted from these conditions.

In view of the continuing growth of Cobb County, the Georgia state agency advised against the immediate addition of 50 beds. A thorough study of the hospital needs of Cobb County was in order, since a completely redesigned hospital, with expanded central services, would be needed in the long run. It would have been better, and cheaper, had Kennestone Hospital been originally designed for great expansions in size.

Suburban development does not necessarily take place in equal amounts in all directions from the central city. In some instances, natural barriers may prevent the metropolitan area from expanding in certain directions. In other instances, established lines of transportation, such as

33./ The Cobb County Times, Marietta, Georgia, April 7, 1955, p. 2.

34./ Interview with Millard Wear, Administrator, Kennestone Hospital, in Atlanta, January 16, 1956.

commuter railroads, will determine the directions along which expansion takes place. Where there are no natural barriers to expansion, and where there are enough roads to permit commuting by automobile to all sectors of the area, the metropolis will expand more or less evenly in all directions from the city center.

In the Miami metropolitan area, the distribution of water and marshland has had a definite influence upon the direction of suburban growth. The completion of a series of causeways has permitted a growth of population in Miami Beach, east of downtown Miami, but the insular nature of the beach area will limit population growth in the future. To the west, marshy conditions have restricted residential development beyond Hialeah and Coral Gables. The major avenues for expansion are to the north and south, along the well-traveled transportation arteries of U.S. Highways No. 1 and 441.

During recent years, hospital development in the Miami area has followed patterns determined by these conditions. Mercy Hospital, the second largest hospital in the metropolitan area, is located three miles south of the city center, near South Bay Shore Drive. This facility was constructed as a 260 bed hospital during the period following World War II, and a 40 bed addition was completed in November, 1956. North Shore Hospital, located more than four miles

north of the city center near U.S. Highway No. 1, opened a 55 bed addition in August, 1956, raising its normal bed complement to 160. 35./

In the Los Angeles metropolitan area, the principal hindrance to movement from the city center is the low mountain range crossing the metropolitan area from east to west, separating Los Angeles and its neighboring cities from the San Fernando Valley. This range, termed the Santa Monica Mountains, can only be crossed at such places as Cahuenga Pass, unless one is willing to take a winding route over the crest of the mountains.

Recognizing this obstacle to transportation, the California state agency has used the crest of the Santa Monica Mountains as the dividing line between certain hospital service areas in the Los Angeles metropolitan area. Hospital Service Areas I-20, centered at Burbank, and R-52, centered at San Fernando, lie to the north of this crest. Areas B-3, centered at Beverly Hills, and I-22, centered at Santa Monica, lie to the south of the mountain range.

36./

Where natural barriers do not interfere, and where lines of transportation stretch outward from the city center in all directions, the suburbs will develop in more or less

35./ Florida State Plan, Hospital Department, Florida Development Commission, Tallahassee, 1957, p. 52.

36./ Hospitals for California, p. 19.

even patterns around the central city. This has happened in metropolitan Atlanta, with the result that each sector of the suburban area now has sufficient population to support one or more hospitals. In November, 1955, the Suburban Atlanta Hospital Advisory Council was formed to work toward the construction of suburban hospitals for the Atlanta metropolitan area. This agency represented four groups, representing the following sectors of suburban Atlanta:

1. The eastern sector, represented by a committee designated by the commissioner of DeKalb County.
2. The northern sector, represented by the North DeKalb Hospital Authority, an organization interested in constructing a hospital near Chamblee.
3. The western sector, represented by a group of nursing sisters from the Catholic Colored Clinic, who were planning a church-affiliated hospital in the Negro area of west Atlanta.
4. The southern sector, represented by the Tri-City Hospital Authority, an organization interested in constructing a hospital in Hapeville, East Point or College Park.

In January, 1957, the Division of Hospital Services, Georgia Department of Public Health, issued a report recommending that priority for future hospital construction grants be given to the growing suburban areas of metropolitan Atlanta. 37./

37./ Survey of the Need for Suburban Hospital Service in the Atlanta Metropolitan Area, Division of Hospital Services, Georgia Dept. of Public Health, Atlanta, 1957, pp. 6, 43.

Suburban hospitals can have other uses besides providing for the immediate needs of their service areas. In the section relating to downtown hospitals, the military dangers of overconcentrating beds in the downtown areas have been discussed. Although architectural methods, such as specially constructed buildings, have been proposed whereby hospitals might stave off the dangers from atomic warfare, the only practical solution will be to distribute hospitals away from the target cities and the industrial plants. Suburban hospitals, if placed far enough from the center of the metropolis, will provide hospital care to the survivors of an atomic attack in the event that the downtown area were destroyed. 38./

Another desideratum of an effective civil defense plan is a series of evacuation hospitals, placed even farther from the central city. The provision of such a system of hospitals could be expensive, since the outlying rural areas cannot support enough hospital beds during peacetime to provide standby evacuation facilities for the metropolitan areas.

A possible solution to this problem is the portable emergency hospital. A 200 bed mobile hospital, modeled after the mobile surgical hospital used by the U.S. Army, has been devised for the Federal Civil Defense Administration. Although it contains operating room equipment, a pharmacy,

38./ Isadore Rosenfield, "Hospital Versus the Atomic Bomb," The Modern Hospital, Vol. 75, No. 6, Dec., 1950, pp. 58-60.

laboratory and X-ray equipment and cots for patients, the hospital unit weighs only twelve and one-half tons and can be transported in a single van. It can be set up in approximately four hours in a school or a similar building; food service, however, must be provided from other sources. 39./

The Federal Civil Defense Administration has ordered 200 of these units, and 90 more have been ordered by cities and states under a matching funds program. 40./ The first of five such hospitals ordered for the state of Georgia has been stored at Carrollton, 52 road miles west of Atlanta, and will be used to train disaster workers. Carrollton was chosen because it was "far enough away not to be threatened by a possible attack on an urban center and close enough to be accessible." 41./

The principles underlying regional hospital planning in metropolitan areas may be summed up as follows:

A. The Central City

1. Because of the dense concentration of people in the central city, the planner must avoid the temptation to construct metropolitan hospitals which are too large from the standpoints of personalized care and operating efficiency.

39./ "Civil Defense Hospital," Science News Letter, Vol. 65, No. 21, May 22, 1954, p. 323.

40./ Ibid., p. 323.

41./ The Carrollton Times-Free Press, Carrollton, Ga., December 17, 1954, p. 1.

2. Because of the noise, blight and congestion of the downtown areas, the problems of civil defense, and the stable or declining population of the typical central city, the planner should avoid the overconcentration of hospital beds in the downtown area. If an overconcentration exists already, the situation can be alleviated by rebuilding hospitals in the suburban areas when their downtown plants became obsolete.

3. If not all the hospitals in the downtown area can be relocated, the surplus of beds can be devoted to specialized medical cases referred from other localities.

4. If new hospitals are to be constructed in the downtown area, a desirable environment should be created surrounding the site.

5. Hospitals should be coordinated with neighborhood units in extensive plans for urban redevelopment.

B. The Suburban Areas

1. As traffic conditions between the downtown areas and the suburbs deteriorate, public safety and convenience will require that hospitals be constructed in the suburbs.

2. Due to the rapid growth of suburban areas, suburban hospitals should be designed for considerable future expansion, with large sites and large cores of central service facilities.

3. The hospital planner should study topographic and other influences upon metropolitan expansion to determine

which portions of the suburban areas will require the most hospital beds in the future.

4. In the event of a disaster affecting the metropolis, the burden of emergency care will fall upon hospitals in the suburbs and in the outlying metropolitan fringe areas. A system of portable emergency hospitals will supplement these hospitals at a low cost and with a great degree of flexibility.

VII. THE PROBLEMS OF SPECIAL AREAS IN REGIONAL HOSPITAL PLANNING

Certain areas, by virtue of special conditions existing within their borders, become special problem areas for the regional hospital planner. Among such areas are those containing hazardous industries, those changing from one type of economy to another, those experiencing strong seasonal fluctuations in population, and those possessing special endemic diseases.

The most hazardous industries, of those which employ large numbers of people and which are well established in certain areas, are the logging and wood finishing industries. The mining industries run second. Transportation industries can be hazardous where traffic accidents are frequently encountered, or where a break in transportation requires the handling of cargoes. Manufacturing is a relatively safe industry, except in the case of lumber mills and foundries. It is interesting to note that plants manufacturing explosives are among the safest places in which to work; safety precautions are so stringent that accidents rarely occur.

1./

1./ Work Injuries in the United States, During 1952, Bulletin No. 1164, U.S. Dept. of Labor, Bureau of Labor Statistics, Washington, D.C., 1954, pp. 18-25.

The western states, inasmuch as mining and lumbering play important roles in their economies, have been cognizant of the importance of hazardous industries to hospital planning. The eastern states, with their heavier emphases upon agriculture and manufacturing have stressed the safety factor less often, although some examples of planning for hazardous industries have been found in all sections of the United States.

Lumbering, which stands in a class by itself among hazardous industries, has been of concern to the state hospital planning agencies of such states as Oregon and Montana. The state hospital plan of Oregon has allotted additional hospital beds to Coos, Curry and Tillamook counties, located in the Willamette Valley, largely to accommodate the victims of logging and sawmill accidents. 2./ These counties are located in the humid western portion of the state, which supports great stands of evergreen saw timber. Yet, even in the drier eastern portion of Oregon, the Oregon State Board of Health has recommended a 20 bed hospital at Fossil, Wheeler County, for such emergencies as logging accidents. 3./

As one progresses eastward across the semiarid Columbia Plateau, the precipitation increases when one

2./ Oregon State Plan for the Construction of Hospitals and Public Health Centers, 1955 Revision, Oregon State Board of Health, Portland, 1955, pp. 46-49.

3./ Ibid., p. 51.

approaches the Rocky Mountains. Lumbering again becomes an important part of the economy in the ranges of northern Idaho and western Montana. The Montana State Board of Health has recommended the construction of a 10 bed community clinic at Eureka, and a 35 bed hospital at Libby, because of the hazardous logging industry of Lincoln County. This portion of the state is traversed by the heavily forested northern Rocky Mountains, which support one of the major logging industries of the West. 4.

Another great lumber producing section of the United States may be found in the humid Southeast. The chief sources of forest products, including lumber, are the extensive pine woods of the Atlantic and Gulf Coastal Plains. The utilization of these forests has had a varied history; naval stores have been produced for some time, but recently wood pulp factories have been established at a number of points. In Georgia, wood pulp manufacturing is carried on at Savannah, Jesup and St. Mary's. The growing demand for wood pulp, which may be made into paper, fibers, plastics, and building materials, has brought with it an increase in logging activity, and thus an increase in logging accidents. One of the considerations leading to the approval of a 25 bed community hospital

4. Montana State Plan for Hospital Construction, Hospital Survey and Construction Division, State Board of Health, Helena, 1948, p. 8.

for Camden County, Georgia, was the extensive logging industry which feeds the new Kraft paper mill at St. Mary's. 5./

The mineral industries have been of concern to the state hospital planning agencies of such mining states as Utah and New Mexico. Utah is straddled by the Wasatch Mountains and by parallel ranges which are rich in both coal and the non-ferrous metals, such as gold, silver, lead, zinc, and copper. The State Department of Health of Utah has consequently planned a number of community clinics for mining towns in the mineral rich areas. In Summit County, which is rich in coal and metals, a 14 bed facility has been planned for Park City. Elsewhere in the mining areas, a 10 bed facility at Milford and an 18 bed facility at Heber City have been recommended. The state agency has also planned to remodel and expand the Price City Hospital, in a coal mining area, and to establish a hospital of 35 beds at Vernal to serve the Rangely oil field. 6./

In New Mexico, 20 hospital beds have been recommended for San Juan County, largely because of the mining and petroleum extraction industries. McKinley County, according to the New Mexico Department of Public Health, may need hospital

5./ A Survey of Hospital and Medical Care Needs in Camden County, Division of Hospital Services, Georgia Department of Public Health, Atlanta, 1956, p. 4.

6./ The State Plan for the Construction of Hospitals and Health Centers in the State of Utah, State Department of Health, Salt Lake City, 1947, pp. 12-15.

facilities in the future because of its increasing activity in mining and in natural gas. Valencia County is considered well supplied with medical care facilities, due to the ambulance services provided between Grants and Albuquerque, but will be in need of more hospital beds if uranium mining is developed in the county. For this eventuality, the New Mexico Department of Public Health has recommended additional hospital beds at both Grants and Belen. 7./

Areas which are traversed by major arteries of transportation will have to make provisions for the victims of traffic accidents. Motor vehicles account for the greatest proportion of traffic accidents occurring within the United States; the National Safety Council has estimated that 1,350,000 motor vehicle injuries of all types occurred within the United States during 1955. This amounts to more than 15% of all accidental injuries estimated for the nation during that year. 8./ Therefore, from the standpoint of volume of traffic injuries, highways present the greatest problem to the regional hospital planner. Railroads, the second greatest source of transportation accidents, accounted for far fewer deaths and injuries. Water-borne traffic is not particularly hazardous to life and limb except in certain

7./ New Mexico State Plan for Hospital Construction, Revision No. 6, New Mexico Dept. of Public Health, Santa Fe, 1954, pp. 52-55.

8./ The New York Times, February 3, 1956, p. 6.

localities, namely, at the docks where loading and unloading take place.

The greatest strain placed upon local hospital resources by motor vehicle traffic occurs when a heavily traveled highway passes through, or near, a series of small towns. An automobile accident, particularly one involving two or more vehicles, can put a sudden strain upon a small community hospital. During the hospital survey of Cumming, Forsyth County, Georgia, local physicians estimated that approximately 50 serious highway accidents occurred each year in the area, resulting in 75 to 100 annual hospitalizations. Most of the accidents occurred on heavily traveled U.S. Highway No. 19, which connects Atlanta with the vacation lands of the Blue Ridge. 9./ In view of the fact that, during the year of the survey, 1955, there were only 1,166 admissions to the 22 bed private hospital at Cumming, 75 to 100 admissions would constitute a significant proportion of the hospital load. 10./ The Division of Hospital Services, Georgia Department of Public Health, took this heavy accident load into account when it recommended a 30 bed general hospital for Cumming.

9./ Survey of the Hospital and Medical Care Needs of the Cumming-Forsyth Area, Division of Hospital Services, Georgia Department of Public Health, Atlanta, 1955, p. 4.

10./ Georgia Master Hospital and Medical Facilities Plan, 1956 Revision, Georgia Department of Public Health, 1956, Exhibit D, p. 3.

An even heavier volume of traffic is experienced over the public highways of Georgia which act as major traffic arteries between the northern states and important southern localities. U.S. Highway 41, which funnels traffic from the Midwest into the Southern Piedmont and Florida, is one of the best examples of such heavily traveled roads. The Gordon County hospital, a 40 bed facility opened at Calhoun, Georgia, in 1953, has been frequently required to set up emergency beds to accommodate the victims of accidents on this highway. The construction of this hospital, with three wards of four beds each, has resulted in inflexibility in the admission of patients, an undesirable feature in a small hospital which must admit frequent emergency patients. Therefore, in 1955 the hospital requested a survey to determine the feasibility of remodeling the hospital to permit more flexibility in admissions. 11./

The 27 bed Terrell County Hospital, opened in Dawson, Georgia, in 1951, has experienced a heavy accident case load as a result of the heavy traffic on U.S. Highway 280 between Albany and Columbus, the two leading cities of southwestern Georgia. The economic problems of this hospital have been increased by the fact that many of the accident victims are

11./ Interview with Miss Bethena Hilsman, R.N., Administrator, Gordon County Hospital, Calhoun, Ga., June 14, 1955.

out-of-state residents, and it is often difficult to collect hospital bills from such patients. 12./

The problem of highway traffic is related to the problems of tourism, since many tourists now choose the automobile for their vacation trips. The Oregon State Board of Health, in planning additional hospital beds for the counties on its Pacific coast, considered summer tourist travel as well as logging operations as factors in making this provision. 13./ The Colorado State Department of Public Health considered both summer and winter tourism to be significant reasons for the establishment of a 10 bed community clinic at Idaho Springs, a resort community in the Front Range, 34 road miles west of Denver. 14./ The eastern states are not without this problem; the Indiana state agency has allotted additional hospital beds to Michigan City to accommodate the tourist population. 15./ This city on Lake Michigan is close to the Indiana sand dunes and has become popular as a summer resort.

12./ The Atlanta Constitution, May 4, 1953, p. 26.

13./ Oregon State Plan for the Construction of Hospitals and Public Health Centers, Oregon State Board of Health, Portland, 1955, pp. 46-49.

14./ Colorado State Plan for Hospital and Health Center Construction, State Dept. of Public Health, Denver, 1953, p. 21.

15./ Indiana Hospital, Medical Facilities and Health Center Plan, Indiana State Board of Health and the Indiana Advisory Hospital and Health Center Planning Council, Indianapolis, 1956, p. 26.

The state of Florida has unusually severe problems of hospital planning resulting from tourism. For example, many of the hospitals in the resort areas have low annual occupancy rates, but are actually approaching their maximum occupancy rates during certain periods of the year. The supply of beds in the state is less adequate than would appear from an analysis of bed-to-population ratios, since such ratios are based upon the permanent, year-round population of the state rather than upon the temporary population found in the state during certain seasons. 16./

The college or university town presents similar problems to those of the resort community by virtue of the strong seasonal demands placed upon hospital facilities. It is true that the majority of educational institutions provide infirmary facilities for their student population, thus relieving the college community of the responsibility of providing medical care for students. On the other hand, the growing numbers of married students with families will still be sufficient to produce seasonal fluctuations in the demand for hospital beds in the community. Vacation periods and summer sessions will become slack periods. Sudden demands for service may appear during the times of sports events, commencement exercises and conventions.

16./ Florida State Plan for 1956, Hospital Section, Florida Development Commission, Tallahassee, 1956, p. 10.

The establishment of medical schools, with their teaching hospitals, will not solve all the medical care problems of college towns. Such facilities will be of help in emergencies affecting the non-students in the area. Elective medical care, including obstetrical care, cannot necessarily be sent to the college facilities. In order to obtain a broad range of clinical material, medical school hospitals prefer to fill their beds with patients drawn from a wide geographic area. Therefore, no matter how many beds are provided in teaching hospitals sponsored by the college medical school, the community in which the college is located will still be faced with the necessity of caring for the fluctuating non-student population.

The Oregon State Board of Health, for instance, has allotted 28 additional hospital beds to Benton County, which contains the college town of Corvallis, to take care of the periodic influx of people into the area. Athletic events at Oregon State College were considered to be the greatest single source of fluctuations in demand for hospitalization. Travel to and from the University of Oregon, at Eugene in Lane County, was considered a factor, along with that of the lumber industry, in allotting additional beds to the county. 17./ The

17./ Oregon State Plan for the Construction of Hospitals and Public Health Centers, Oregon State Board of Health, Portland, 1955, p. 49.

Indiana State Board of Health has similarly allotted additional hospital beds to the cities of Greencastle, with DePauw University, and Bloomington, with Indiana University.
18./

Another source of seasonal fluctuations in occupancy is migrant agricultural labor. The 100 bed Pioneer's Memorial Hospital, located in the Imperial Valley of California, is faced with the problem of caring for the 6,000 migrants who enter the area from Mexico during planting and harvest times. This situation is intensified by the phenomenon of tourism in reverse, namely, the exodus of residents from the low-lying valley during the extremely hot summer. The architectural planning of this facility had to permit economic operation under widely differing occupancy rates. 19./

Florida is another one of the states with a migrant labor problem. The Florida state agency has thus assigned additional hospital beds to areas which have seasonal expansions of population due to crop harvesting activities. In 1956, for example, additional hospital beds were assigned to Palm Beach County, which not only had a seasonal influx

18./ Indiana Hospital, Medical Facilities and Health Center Plan, Indiana State Board of Health and the Indiana Advisory Hospital and Health Center Planning Council, Indianapolis, 1956, pp. 25-26.
19./ "North of the Border and 101 Feet Below Sea Level," The Modern Hospital, Vol. 76, No. 2, Feb., 1951, pp. 60-62.

of tourists in its Atlantic coast area, but also had seasonal influxes of migrant laborers in the western area near Lake Okeechobee. 20./

The structure of the local economy will also affect hospital operation. Agricultural populations have traditionally been low users of hospital services. A number of reasons for this phenomenon have been suggested, such as conservative rural attitudes toward hospitalization, or the isolation of rural hospitals from potential patients through poor rural roads. Studies of this problem, on the other hand, have shown that rural populations with high incomes use hospitals more than rural populations with low incomes, indicating an economic reason for the lower rural hospital use. 21./

The spread of hospitalization insurance through farmers' organizations, plus the period of relative agricultural prosperity that came with the Second World War, have done much to increase the occupancies of rural hospitals. Yet, disasters affecting the agricultural economy will still produce a marked effect upon the hospitals patronized mainly by farmers. In view of the economic marginality of rural hospital patronage, a severe crop disaster might even threaten the existence of a hospital.

20./ Florida State Plan for 1956, Hospital Section, Florida Development Commission, Tallahassee, 1956, pp. 6, 56.

21./ Frederick D. Mott and Milton I. Roemer, Rural Health and Medical Care, New York, McGraw-Hill, 1948, pp. 221-229.

During the early nineteen-fifties a series of severe droughts struck portions of the southern and western United States. During 1954 the situation became critical in southern Georgia; the 25 bed Pierce County Hospital, at Blackshear, was located in an agricultural area which suffered severely from the dry weather. This facility, opened in October, 1953, was already having difficulty building up a medical trade area. The hospital experienced periods, up to three days in length, without a single patient, and by 1955 there was serious discussion of closing the facility. 22./ The 1954 New Mexico State Plan noted that the Curry County Hospital had been closed during the previous year, possibly due to the economic effects of drought conditions. 23./

Manufacturing generally provides a higher monetary return for the laborer than agriculture, and fringe benefits, such as hospitalization insurance, are becoming more commonplace for the industrial worker. Further, although the remuneration for industrial employees will vary according to economic conditions, the fluctuations in employment are usually less severe than the fluctuations in crop return risked by the farmer, who must contend with the forces of nature. Unemployment insurance has, in recent years, contributed

22./ Interview with Mr. William E. Uzzell, Chief, Survey & Planning Section, Georgia Department of Public Health, Atlanta, Nov. 11, 1955.

23./ New Mexico State Plan for Hospital Construction, Revision No. 6, New Mexico Dept. of Public Health, Santa Fe, 1954, p. 57.

additional security for the persons employed in manufacturing.

Therefore, manufacturing areas face different economic problems of hospital care than agricultural ones. The most severe problem area will be the one in transition from agriculture to manufacturing; due to population growth, rising income and increased coverage by insurance, the demand for hospital services can easily outrun the available facilities. This pattern of increased hospital utilization, rather than the accident problem, becomes the real hospital care problem of the manufacturing city.

An interesting example of this problem has occurred at Cedartown, Georgia, a city of 9,470 inhabitants located in the western Piedmont area of the state. This community has developed a manufacturing economy based upon rubber goods, textiles and chemicals. The Polk General Hospital, a 32 bed facility completed in 1948, soon proved inadequate to serve the community and its environs, whereupon a 10 bed addition was approved under the auspices of the Hill-Burton Program. Although placed in operation in 1951, this addition soon proved inadequate and a request for a second addition was received by the Division of Hospital Services, Georgia Department of Public Health, in 1953.

During the hospital survey of Cedartown and Polk County, it was revealed that the major reason for the sudden demand for hospitalization was the influence of labor

contracts recently put into effect in the Cedartown area. These contracts provided hospitalization insurance, partly at company expense, for the Negro as well as for the white employees of the local mills. The families of the Negro employees began to use the Polk General Hospital in large numbers; the most significant increase was noted in the demand for obstetrical care, which had previously been provided at home for most Negroes. The Polk General Hospital, a segregated facility, was unable to accommodate this sudden increase in nonwhite patient load. 24. The Division of Hospital Services, Georgia Department of Public Health, approved a second addition for the Polk General Hospital, this time a 10 bed addition to the Negro section, which was completed in May, 1956.

Other industrial areas of Georgia have been lagging in providing hospital services. Brunswick, a city of 19,500 inhabitants in 1955, has prospered through its local industries, which include naval stores, shipyards, seafood processing plants, chemicals and the like. These plants had a high percent of their employees covered by hospitalization insurance. A 77 bed hospital, capable of considerable expansion, was opened in Brunswick in January, 1954. One year later, the facility was suffering from overcrowding;

24. Interview with Mr. T.B. Wolfe, Jr., Administrator, Polk General Hospital, Cedartown, Georgia, Sept. 11, 1953.

89 beds had been set up in the structure designed for but 77, and daily occupancies as high as 109 did occur. 25./ An expansion of the hospital to 127 beds was recommended, but before this project could be completed, the occupancy had risen so high that the hospital staff foresaw the need for a second addition. During the first 13 days of February, 1957, the hospital operated with at least 105 patients every day, and a peak load of 127 patients was experienced at one time. A second survey of the hospital needs of Brunswick was conducted by the Division of Hospital Services, Georgia Department of Public Health in February, 1957, although the final decision concerning the proposed second addition was delayed pending the completion of the first addition. 26./

Endemic disease patterns, a favorite topic of medical geographers, have relatively little influence upon regional hospital planning within the continental United States. A few examples may be found where specialized hospitals have been constructed to serve the patients suffering from some specific endemic illness. For example, Hansen's disease, a rare ailment within the United States, is more apt to be found in the warm, humid Gulf coast states.

25./ Conversation with Mr. A.A. Rosser, Administrator, Glynn-Brunswick Memorial Hospital, March 3, 1955.

26./ Survey for Second Addition to the Glynn-Brunswick Hospital, Division of Hospital Services, Georgia Department of Public Health, Atlanta, 1957, p. 7.

Consequently, the national leprosarium has been established at Carrville, Louisiana. Within the state of Georgia, two community tuberculosis hospitals, of 55 and 45 beds respectively have been established in Savannah and Columbus to accommodate the large number of tubercular cases originating in the crowded, low-income areas of these cities.

In general, the advances in medical science have reduced the incidences of communicable diseases to the point where it is hard to define endemic patterns within the United States. The virtual disappearance of malaria from the south-east is a clear-cut example of this progress. Some rural-urban differentials in disease patterns still exist, but these need not affect the number of beds required in either rural or urban areas. Mott and Roemer, in a comprehensive study of rural medical care problems, concluded that "in relation to the total volume of sickness of all types, the main problems in rural and urban medicine are more alike than they are different." 27./

The underdeveloped nations of the world are less fortunate in that communicable diseases are still prevalent and often form definite endemic patterns according to the specific environmental factors affecting the disease. For example, Mexico, in its development of a network of public

27./ Mott and Roemer, Op. Cit., p. 113.

hospitals, had to consider endemic disease patterns as significant factors in planning. Malaria, intestinal parasitism onchocercosis were among the established diseases which constituted, in some zones of the country, "a major source of physical impairment of the inhabitants and economic instability." 28./

The famed "jungle hospital" of Dr. Schweitzer, located at Lambarene, French Equatorial Africa, is an even more striking example of the facility located in a region with pronounced endemic disease patterns. The main illnesses affecting the patients, contrary to the American and European patterns, are sleeping sickness, Hansen's disease, intestinal parasitism and wounds. 29./ Since many of the illnesses require a long stay for the patients, and since the African's life patterns differ from those of the European, special housing arrangements had to be provided. The hospital, which consists of a number of separate buildings, is surrounded by native huts where the long-term patients live. The patients often bring their families and have their women cook for them; in this fashion they may visit the hospital buildings for treatment and yet avoid being torn from their

28./ Gustavo Baz, M.D., "A Network of Hospitals is Mexico's Immediate Goal," Hospitals, Vol. 17, No. 8, Oct., 1953, pp. 45-47.

29./ Helen Yast, "The Settlement of 45 Roofs," Hospitals, Vol. 28, No. 5, May, 1954, pp. 80-82.

customary way of living. The lepers, who may have to stay as long as seven years, are isolated in a special village approximately one mile from the main settlement. 30./

The problems of hospital planning in special problem areas may be summarized as follows:

1. Areas containing hazardous industries, especially those of lumbering and mining, will require additional hospital beds and perhaps even additional hospitals to accommodate the victims of accidents.
2. Transportation arteries, especially major highways, will also require additional hospital beds and facilities along their routes to accommodate victims of accidents.
3. Areas experiencing seasonal influxes of people, such as tourists or migrant workers, will require additional hospital facilities, capable of economical operation under widely differing rates of occupancy.
4. Areas in the process of industrialization will experience suddenly rising demands for hospitalization because of economic changes occurring within the population. Hospitals in agricultural areas will be subject to the caprice of weather and the crop market, and may require subsidies or cash reserves to carry them through periods of economic stress.

30./ Clara Urquhart, "A Visit to the Africa of Dr. Albert Schweitzer," Phylon, Vol. 14, No. 3, Sept., 1953, pp. 298-299.

5. Endemic disease patterns are now of little importance to the regional hospital planner of the medically advanced nations, but can still affect hospital planning in the underdeveloped lands of the world.

VIII. THE PROBLEMS OF MINORITY AND OTHER GROUPS IN REGIONAL HOSPITAL PLANNING

In the preceding chapters the principle has been established that, if possible, no portion of the hospital planner's region should be without access to hospital facilities. This principle holds true for both the physical area and for the population of the region. Any regional hospital plan which fails to provide effective and convenient care for all segments of the population will be as inadequate as one which fails to provide access to hospitals from all portions of the inhabited land.

The U.S. Public Health Service, in its regulations pertaining to the administration of the Hill-Burton Program, has recognized the above principle in the following words:

1./

General. The State plan shall provide for adequate hospital, diagnostic or treatment center, rehabilitation facility, and nursing home service for the people residing in a state without discrimination on account of race, creed or color, and shall provide for adequate facilities of these types for persons unable to pay therefore.

This statement, as interpreted, specifies that the planner shall include facilities for all racial, religious,

1./ Public Health Service Regulations, Part 53, U.S. Department of Health, Education and Welfare, Public Health Service, Washington, 1955, Sec. 53.111.

ethnic and economic groupings of people in the state hospital plan. The problems encountered by the planner in carrying out this mandate are created by local laws, customs and attitudes relating to the different groups involved.

Where a minority group is present in a small concentration, it rarely constitutes a problem for the hospital planner. Where the group is present in a strong concentration, and where local attitudes or statutes require separate treatment for the group, noteworthy problems will arise.

The simplest method of providing hospitalization for different segments of the population is to assign hospital beds to patients without regard to their ethnic, racial or economic status. This permits maximum flexibility in the assignment of beds, prevents the duplication of hospital space, personnel and equipment, and facilitates the prompt hospitalization of those in need of care. Any method of assigning patients to separate facilities according to their minority group status can result in delay in hospitalization, and probably will result in increased cost of medical care. However, the lesser the degree of separation of the groups, the lesser the added inconvenience and expense.

Three means exist whereby separate hospital facilities

may be provided for different segments of the population:

1. The members of the groups may be accommodated in separate sections of the same hospital.
2. The different groups may be assigned to separate hospital buildings operated by the same sponsor.
3. The different groups may be assigned to separate hospitals under different sponsorship.

The Hill-Burton Program, as presently constituted, does not forbid the separation of groups in hospital facilities constructed under its auspices. What is forbidden is the failure to make provisions for all groups. The following regulations of the U.S. Public Health service are specific on this point: 2./

Nondiscrimination: Before a construction application is recommended by a State agency for approval, the State agency shall obtain assurance from the applicant that the facilities to be built with aid under the Act will be made available without discrimination on account of race, creed or color, to all persons residing in the area to be served by that facility. However, in any area where separate hospital, diagnostic or treatment center, rehabilitation or nursing home facilities are provided for separate population groups, the State agency may waive the requirement of assurance from the construction applicant if (a) it finds that the plan otherwise makes equitable provision on the basis of need for facilities and services of like quality for each such population group in the area, and (b) such finding is subsequently approved by the Surgeon General.

The assignment of separate hospital space for different groups may stem from one or more of three causes:

2./ Ibid., Sec. 53.112.

1. Discriminatory laws, or discriminatory attitudes held by the dominant segment of the population, which prohibit certain groups from using facilities used by the remainder of the population.

2. A desire, on the part of the government or other interested agency, to improve medical care standards for a group which is not well supplied with hospital facilities.

3. The actions of the group itself, which may possess such cohesiveness and such a sense of responsibility to its own members that it provides hospital care for them through its own resources.

The principal example of the first type of separation of groups is that of racial segregation, practiced with the Negro population of the United States. At one time this practice was mainly confined to the southeastern portion of the nation, but, with the migration of Negroes to northern metropolitan centers, less formalized segregation has been appearing in other regions as well.

The second type of separate provision of services, which arises from the actions of an interested outside agency, may be found in the hospitals run by the United States Government for the aboriginal populations, Eskimo and Indian, in our states and territories.

The third type of separation may be found in the hospitals operated, in our larger cities, by organizations

composed of people with a common linguistic or nationality background. The hospitals operated in Tampa, Florida, by Spanish language fraternal organizations are a case in point.

In some localities, economic groups, particularly the indigent, are assigned to separate hospital facilities. The problem of medical indigency is closely related to that of ethnic or racial minority group status, since low social status is heavily correlated with low economic status.

The problems arising from the provision of separate facilities for different groups are similar to those of the provision of facilities for areas of sparse population. As smaller groups of people are being served by each hospital, or by each separate unit of a hospital, it becomes difficult to maintain efficient, economical, high quality care because of the separation of services. For example, a community capable of supporting an efficient, 50 bed hospital might find itself maintaining two inefficient, 30 bed hospitals if rigid separation of racial groups is maintained. Even if both groups are served in the same hospital building, some additional expenses will be unavoidable if distinct, separate units are provided.

The expense of small, separate hospitals is so great that few small communities can afford to support them. Thus, in Georgia, the majority of hospitals for Negroes are found in the metropolitan cities, where enough Negroes can be found

to justify separate hospitals which are large enough to be efficient, independent units. Seven Negro hospitals, totaling 482 beds, are found in Atlanta, Macon and Savannah. Only two of these are less than 50 beds in size, the 32 bed St. Luke's Hospital in Macon, and the four bed Catholic Colored Clinic in Atlanta.

Three Negro hospitals, with a total of 104 beds, are located in the medium-sized Georgia cities of Bainbridge, Newnan and Americus. In 1955, the population of these communities ranged between 8,200 and 12,500. The 50 bed Griffin Hospital, in Bainbridge, owes its existence to the efforts of its founder, Dr. Griffin, a Negro physician who has built up a large practice in Decatur County. The other two are publicly supported institutions. The 35 bed Americus Colored Hospital, at Americus, is only a quasi-separate facility. During the planning of new hospital facilities for Americus, representatives of the Georgia state agency advised against the provision of separate hospitals for the two races. So strong was local feeling on this subject that a compromise was reached in which two buildings were constructed on the same site, connected by a covered archway. In this fashion, some services could be shared by both hospital units, resulting in economies of operation not possible with two distinct hospitals in different parts of town.

Yet, even this partial consolidation of facilities has not proved to be economical and convenient in practice. The staff of the combined hospitals and local community leaders have since expressed the opinion that the two units should have been constructed as one hospital unit. 3./

Even the economies effected by providing separate racial units within one structure do not approach the economies obtained through the construction of a truly integrated facility. When sections of a hospital are rigidly compartmentalized as to the admission of patients, bed space may be vacant in one section while another section is overcrowded. The administration of the hospital is, in effect, operating two hospitals in one building, each of which will experience the heavy fluctuations in occupancy characteristic of small hospitals. In practice, the Negro sections of Georgia hospitals have shown lower overall occupancy rates than the white sections, although a few instances have been known where the Negro occupancy rate was higher.

Instances have been known where a hospital has applied for funds to construct additional bed space for white patients, while Negro beds have been little used in the facility. For example, at Kennestone Hospital, Marietta, Georgia, during the summer of 1955, the daily census of colored

3./ Interview with Dr. Lloyd Moll, President, Georgia Southwestern College at Americus, Atlanta, Nov. 7, 1955.

patients was running between five and eight persons, although 20 beds were available for their use. At the same time, white patients were crowding even the solariums of the hospital, forcing the administration to apply for funds to construct additional beds for them. 4./ A similar situation was reported in the Winder-Barrow Hospital, Winder, Georgia, late in the same year.

These situations could have been avoided through the adoption of flexible segregation arrangements. Such arrangements were first tried, in Georgia, at the 25 bed Peach County Hospital, opened in Fort Valley in October, 1953. This system of segregation is merely an adaptation of the same plan used in bus service in the South, in which the white passengers are seated from the front of the vehicle, and the colored passengers from the rear. The seats in the center of the bus are alternately used by either race as occasion demands. Thus, in a small hospital, one corridor of patient bed rooms is divided into Negro and white sections. Negro patients are, upon admission, assigned rooms in order from one end of the corridor, white patients are assigned rooms from the other end. To give the feeling of separateness deemed important by the segregationist, a movable partition is used to delineate the two sections.

4./ Interview with Mr. Millard Wear, Administrator, Kennestone Hospital, Atlanta, August 30, 1955.

The same principle was employed in the 34 bed Newton County Hospital at Covington, which was opened for use in October, 1954. A variation on the same principle has been employed in the Hill-Burton hospitals built in the north-eastern part of the state of Georgia, where there are too few Negroes to justify separate Negro wards of any type. An example of this is the Rabun County Hospital, a 20 bed facility opened at Clayton, Georgia, in November, 1951. In 1950 there were only 93 Negroes in the county population of 7,424. Thus, the greater part of the time there are no Negro patients in the facility. When a Negro does apply for admission, he is merely assigned a private room, regardless of his ability to pay private, semi-private or ward room rates. Any loss thus entailed is minor compared to the cost of maintaining a separate section of the hospital which will remain vacant most of the time. This policy is analogous to the policy once followed by the Pullman Company in assigning space to Negroes who requested accommodations for traveling through states with segregation laws. A Negro who requested a berth, upper or lower, was given a drawing room at no increase in charge.

Similar policies were recommended for the 14 bed Lee M. Happ, Jr., Memorial Hospital, opened for service in February, 1952, at Hiawassee, and for the 30 bed Forsyth County

Hospital, under construction at Cumming. The survey for the latter facility recommended no Negro section, but instead merely stated that "two rooms be available for the use of nonwhite patients." 5./ Two rooms might be required in the event of an automobile accident involving Negroes, or if two colored patients, a man and a woman, requested service at the same time.

Flexible segregation arrangements are difficult to adopt if a hospital has previously been constructed with rigidly separated Negro and white sections, as in the instances where the sections are located on different floors. Any attempt to move patients from one floor to the other could bring objections from the patients, staff or general public, as this might appear as a clear violation of local customs and laws. An example of rigid segregation arrangements can be found in Winder, Georgia, in the Winder-Barrow Hospital. This 40 bed facility, opened for service in 1951, has patient bedrooms on two floors of the structure. The first floor contains nine beds for colored patients as well as the central service units of the hospital. The second floor is mainly devoted to rooms containing 31 beds for white patients. Yet, the Negro section has been showing a low occupancy, while the

5./ Survey of the Hospital and Medical Care Needs of the Cumming-Forsyth County Area, Division of Hospital Services, Georgia Department of Public Health, Atlanta, 1955, p. 9.

separate white section is frequently crowded.

During a visit by representatives of the state agency, it was suggested that the hospital place white and colored patients on the second floor, adopting a flexible segregation arrangement. The previous Negro section could be converted to the use of white patients, perhaps as a separate maternity unit. However, despite assurances from the state representatives that such arrangements had been satisfactory in other small Georgia communities, the reply was given that "it wouldn't work in this town." 6./

The best example of the provision of separate hospital facilities for a group through the operation of an outside agency interested in the group's welfare is the system of hospitals for aboriginal populations established by the United States government. It is not often realized that the American Indian is the second largest racial minority group in the continental United States, numbering 343,410 persons, as opposed to 15,042,286 Negroes, in 1950. The regional importance of the aboriginal peoples is greater than these figures would indicate, since their population is concentrated in certain areas which have low total populations. For example, in the state of New Mexico there were 41,901 Indians in 1950,

6./ Interview with Mr. William J. Anderson, Administrator, Winder-Barrow Hospital, Winder, Georgia, November 18, 1955.

constituting more than six percent of the total state population. In Arizona the corresponding figure was 65,761, or nearly nine percent of the state population. The most significant concentrations of aboriginal population have been found in the territories; for example, in 1950 the Eskimos, Indians and Aleuts constituted more than 25% of the Alaska population.

The hospitals constructed and operated for the American Indians and for other aboriginal populations of the United States differ in two respects from those constructed for the use of Negroes. First of all, they are frequently located in districts where there is no sizeable Caucasian population. Thus, they were originally planned by the Federal government to improve medical care standards among the indigenous population, which had no resources of its own to construct hospitals. Secondly, non-aborigines are not necessarily excluded from these hospitals, which are available for emergency care to all persons in their vicinity should no other facilities be available.

Thus, no problem of community-wide service need exist in the provision of hospitals for aboriginal populations. The Alaska hospital plan considers the Alaska Native Service hospitals to be part of the territorial network of hospitals, and in some instances such hospitals are even considered to

be the central hospitals of large hospital service areas.

7./

The foregoing section has given examples of the action of an outside agency to provide medical care for a separate group. Examples do exist where the group itself undertakes to provide hospitalization for its members through its own resources. In Tampa, Florida, two hospitals are operated by fraternal orders of Spanish speaking people for the benefit of their members. Although this constitutes another division of the population for hospitalization purposes, these facilities do serve a considerable portion of the local population and it is not questioned that a fraternal organization has a right to establish such facilities for the welfare of its constituents.

Hospitals intended solely for the indigent are somewhat similar, in their effect, to hospitals intended solely for a racial or ethnic group. They present a barrier to the quick, convenient hospitalization of persons in their service area. While it is true that hospitals usually promise to provide emergency service to all persons in their vicinity, in actual practice such arrangements are frequently honored in the breach. If a poor patient can be shunted to an indigent hospital, the hospital for paying patients is saved the

7./ Hospital Construction Plan of the Territory of Alaska,
Alaska Dept. of Health, Juneau, 1953, p. 4.

risk of non-collection of fees, regardless of the inconvenience or even danger to the patient. Another disadvantage to indigent hospitals lies in the fact that such facilities become stigmatized as charity facilities, and poorer quality of care may be given to the patient. A third disadvantage results from the economic cycle; during prosperous times indigent hospitals may have vacant beds while pay hospitals suffer from crowding; during times of recession the situation may reverse. This situation, like rigid segregation according to race, causes inflexibility in the assignment of patients to beds.

The best solution to this problem would be to have hospitals in the service area provide for the care of all economic groups, receiving compensation from the responsible governmental agencies, or from private welfare funds, to cover the cost of indigent care. Not only would such an arrangement increase the speed and ease of hospitalization for the poor, but it would also permit flexibility in the assignment of beds. Further, the hospital staff, outside of the administration offices, need not know which patients are indigent, thus ensuring a higher quality of care for all.

As in the case of racial segregation, strict economic segregation is practiced mainly in the larger cities. The smaller city cannot afford to support a number of separate facilities. The only public charity hospital in Georgia at

the present time is the new 1,080 bed Grady Memorial Hospital in Atlanta, although a 100 bed charity facility for Negroes, named simply Charity Hospital, is operated by a non-profit association in Savannah. However, Chatham County, which embraces metropolitan Savannah, takes care of part of the remainder of its Negro indigents, plus all of its white indigents, in the new 300 bed Chatham Memorial Hospital, a facility which also serves paying patients of both races. The large, public hospitals of Macon, Augusta and Columbus, plus public hospitals in most of the smaller communities, serve both indigent and non-indigent patients.

This latter course of action is wise, in view of the changes in occupancy that may be expected of indigent hospitals with changes in the national economy. The decreasing occupancy of indigent hospitals in New York, due to the increasing coverage of the population by hospitalization insurance, is an example of inflexibility in the assignment of beds resulting from separate hospitals. A 1955 survey showed that charity beds were vacant in New York City, while hospitals for paying patients had waiting lists for beds. 8./

The principles for planning for minority groups or such other classifications of people as economic groups may be summed up as follows:

8./ The New York Times, December 5, 1955, pp. 1, 18.

1. It is the responsibility of the regional hospital planner to provide hospitalization for all portions of the population, as well as for all portions of the area, of the region he is working with.

2. The provision of separate facilities for different groups, whether they be racial, national, or economic groupings, will lead to inconvenience and delay in hospitalization, will limit flexibility in the assignment of beds, and will entail more expense than the assignment of all general hospital patients to one facility.

3. Where local laws or strongly established customs require the separation of patients by group membership, the least possible amount of separation should be used. Further, arrangements for the separation of patients should be flexible to avoid the overcrowding of certain hospital sections while others are partly vacant.

4. Despite the principles enumerated above, a group must be granted the right to provide hospital care to its own members, using its own resources, should it so desire. In such instances, the regional hospital planner should try to coordinate the separate hospital facilities with the regional hospital plan.

5. All hospital facilities should provide emergency care to persons in their immediate vicinity, regardless of their racial, national or economic status.

IX. BASIC PRINCIPLES OF REGIONAL HOSPITAL PLANNING

In the great majority of states regional hospital planning is a part-time occupation, a sideline assumed by the public health physician, accountant, architect or engineer. Some of the regional planning accomplished by these "regular" public health workers has been excellent. Indeed, a thorough study of the literature of hospital planning will uncover many individual examples of wise planning by men in the traditional public health fields. What is usually lacking is the training and employment of persons who are versed in not one, but many, of the different aspects of regional hospital planning, and who can see the relationships between these different aspects.

The geographic approach, with its integrating and synthesizing method, is ideally suited to the field of regional hospital planning. More geographers should be employed by agencies engaged in hospital planning. It is interesting to note that a private architectural firm, Gordon A. Friesen Associates of Washington, D.C., has employed a professional geographer to assist in regional and community planning problems.

Desirable as it may be, regional hospital planning has yet to become recognized as an independent profession. At the present time, there are not enough full-time positions in the field to justify the development of professional consciousness in the field. A few states, notably Georgia and California, maintain survey and planning sections as part of their administration of the Hill-Burton Program. Other states, such as Michigan, contract with their state universities for planning services.

To be a regional hospital planner, one must first think in regional terms. The hospital service area, the basic unit used by the regional planner, may be thought of as a single factor region. The factor which gives the required degree of homogeneity to the region is that of convenient access to the central hospital of the service area. The small hospital service areas, in turn, may be grouped into larger regions, which will include all places which commonly refer their complicated medical cases to regional medical centers, or which receive specialized medical services from these centers.

The regional hospital planner must also consider the geographic environment in which the hospital service area is located, especially the physical features of the land, which may influence the size and boundaries of hospital service areas. He must be willing to work within the framework of

existing political divisions of territory. He must consider the population density of the region, and be aware of the existence of special problem areas. He must take the composition of the population into account, as well as local attitudes toward minority and economic groups.

The regional hospital planner would face an ideal situation if the following conditions were to exist in his region:

1. The region is relatively smooth and even in its topography, with few significant natural barriers to transportation.
2. The climate is mild, with only moderate seasonal changes in temperature and precipitation.
3. The region is traversed by as few national or state boundaries as possible.
4. The political unit bases are large and approximate the existing trading areas.
5. The region has a relatively even distribution of population.
6. Communities of significant size, and with established trading areas, are so distributed that all portions of the region are within a half hour's journey of an existing or potential hospital center.
7. The population is relatively homogeneous, or local attitudes and laws favor the equal treatment of ethnic, racial

and economic groups.

In opposition to these ideal conditions are the realities, which will force the planner to alter the idealized plan for a network of evenly spaced hospital communities, each supporting an efficiently sized central hospital. Barriers to the movement of patients will truncate the radius served by a general hospital. Conditions of sparse population, on the contrary, may extend the hospital service area beyond its usual limits in order to include sufficient population to support a minimal medical care facility.

Not only is the hospital service area delineated, but also the hospital building may be influenced, by conditions within the region. Much has already been written about the necessity of having the hospital adapt to the physical environment, particularly to climate. Less has been said concerning the need to have the hospital plant adjust to the special problems of the region as, for example, designing a building capable of operating under the different patient loads caused by seasonal fluctuations in population.

Ideal conditions for hospital planning, like any set of ideal conditions, can be found nowhere. In Anglo-America, they may be most closely approached in certain portions of the Middle West, particularly to the west of the

Mississippi River. Even in these regions metropolitan areas are not entirely absent; some rivers, like the Missouri, are large enough to constitute barriers to movement; heavy snows, flash floods and dust storms occur; and racial minorities are slowly increasing in number.

The other regions of Anglo-America are each characterized by one or more of the specific problems affecting regional hospital planning. In the United States, the Northeast has the most numerous metropolitan areas and the most frequent state boundaries, the Southeast has the strongest racial minority problems, and the Far West has the most rugged natural barriers to transportation and the largest areas of sparse population. In Canada are found some of the most severe climatic problems arising from the heavy, persistent snows of the Prairie Provinces. Perhaps the planner in Alaska faces the most difficult problems since he must contend with rugged terrain, limited surface transportation routes, severe climates, large areas of extremely sparse population, and diverse racial and cultural groups.

Examples of extremely poor conditions for regional hospital planning may be found in the underdeveloped lands of the world. The famed "jungle hospital" of Dr. Schweitzer should give us an idea of truly serious problems of hospital location. The hospital lies in a tropical rain forest, where micro-organisms thrive and where certain communicable

diseases which have been eliminated in the Western world are still rampant. The only ambulance for the patient is the canoe, unless he is ambulatory or can be carried by others. Despite these limitations, patients will still travel for weeks to reach the hospital. Emergency treatment for the patient is impossible, save in the immediate vicinity of the hospital. Even a skeleton coordinated hospital system cannot be dreamed of until more hospitals are built.

Despite these difficulties, Lambarene, French Equatorial Africa, is still fortunate in that it has been provided with even an outpost hospital through the efforts of dedicated individuals. Many localities in underdeveloped lands are still awaiting the arrival of their first medical mission. The problems of providing modern hospital care for a nomadic people, such as the Bedouins of the Arabian Peninsula, might exceed even those faced by Dr. Schweitzer and his associates.

The foregoing discussion has shown the importance of the various environmental factors present in a given area. The regional planner must not only be capable of recognizing the environmental factors present in a given area, but he should be able to analyse them in their causal relationships. It is equally important to appreciate the relationships between hospitals and their respective hospital service areas. Too much planning has endeavored to solve the problems encountered in a particular locality, rather than the problems of a

region. The planner must avoid the myopic approach, and must see each proposed hospital as one of a number of coordinated facilities.

In carrying out his purposes, the regional hospital planner must avoid becoming discouraged. It is easy to see the mistakes of the past and present, and even the developing mistakes of the future. It is easy to recognize the forces which are standing in the way of improved hospital planning.

For example, a fertile source for discouragement may be found in the difficulties posed by local jealousies and prides, especially when these are augmented by the division of the planning area into numerous and powerful political units. In some portions of the United States, notably in Georgia, these forces have resulted in the construction of numerous small county hospitals, frequently too close to one another, which act as a deterrent to the development of a coordinated regional hospital system.

Despite such discouragements, the regional hospital planner must remember that almost any hospital, no matter how poorly planned with respect to its environment, will be of some value to the people living in its vicinity. Furthermore, in his zeal for perfection, the planner must not over-emphasize the mistakes and minimize the successes of hospital construction programs. No plan will ever be perfect, and even the best plan may never be fully realized in practice.

The planner must maintain a proper sense of perspective and recognize the perfect plan as a goal that he must strive toward, rather than as a goal that he may actually achieve.

X. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

A. Summary

The effects of geographic conditions upon regional hospital planning can be summed up in the following statements:

1. The regional hospital planner must avoid the effects of barriers to the movement of patients and medical services. These barriers include those created by nature and those created by man:

a. Barriers created by nature include physiographic barriers, such as mountains and large bodies of water, and climatic barriers, such as those created by floods or heavy snowstorms.

b. Barriers created by man include those of traffic congestion, encountered in urban areas, and those of political boundaries.

c. In regions of sparse population, the extreme distances between significant centers of population can constitute impediments to the rapid movement of patients and personnel.

d. Too lengthy time of transportation to the hospital caused by barriers can be overcome by the establishment of hospitals which will be within a reasonable travel time of

every populated place within the region.

e. Where it is not feasible to establish a hospital within a reasonable travel time of every potential patient, special ambulance services, including air ambulance services, may be used to bring patients to hospitals.

2. In addition to solving the problems caused by barriers to transportation, the regional hospital planner must make sure that space will be available to the patients upon their arrival at the facility:

a. Sufficient beds must be available for the patients.

b. Shortages of hospital beds are most likely to be found in areas of rapidly growing population, in special problem areas, and in areas of sparse population.

c. Areas likely to have periodic overloads of patients needing hospitalization should be provided with more hospital beds than would be needed under the average conditions.

3. The hospital planner must take into consideration policies barring certain groups of people from the use of hospital facilities:

a. Policies barring the admission of patients in need of care include attitudes and laws which discriminate against minority groups.

b. The lack of arrangements for care of the indigent will likewise bar the admission of patients in need of care.

c. Hospitals should admit all persons who are in need of care, and should do this with a minimum of delay and a maximum of flexibility in assigning patients to beds. ✓

The application of these principles of regional hospital planning should be carried out by state agencies administering the Hill-Burton Program. Regional hospital planning should be a recognized profession within these state agencies.

The complexity of problems to be considered in regional hospital planning encouraged the states to establish hospital survey and planning sections within the scope of the state agencies. The states of California and Georgia were among the first to establish such sections. Other states likewise contributed commendable examples of both local and regional planning. Minnesota has paid especial attention to the development of regional hospital centers within its Hill-Burton construction program. California has conducted and published excellent studies of regional hospital planning. Other states have included thoughtful analyses of their own regional planning problems in the pages of their state hospital plans.

Governmental agencies are not the only ones interested in improving regional planning for hospitals. The Bingham Plan of New England, which became the model for coordinated hospital systems, has encouraged other regions to develop their own voluntary associations of hospitals. The growth of

hospitalization plans which maintain their own systems of hospitals, such as medical care plans sponsored by labor unions or the Kaiser Foundation plan, may develop opportunities for regional hospital planning outside of the public agencies which administer the Hill-Burton Program.

B. Conclusions

Even though hospital planning agencies have made occasional mistakes, they have been capable of learning from their mistakes. Gradually both the planning agencies and the local communities have learned that hospitals may become financial liabilities as well as public assets. It has also become evident that placing a new hospital close to an existing hospital will undermine the soundness of both facilities, and that it is better to have one strong hospital rather than two weak ones.

Whatever the mistakes made in their administration, the hospital construction programs undertaken during the past generation have been an overall success. Hospitals now exist where none existed before, particularly in rural areas and isolated locations. The farmer and the small town dweller have hospitals closer at hand, and the motorist can drive through lonely stretches of road with a greater sense of security. Outmoded and unsafe hospitals have been replaced by safer buildings with modern equipment, and hospital beds

are now available to minority groups which had no hospitals, or only inadequate facilities, in the past.

C. Recommendations

Hospital and medical care planning agencies should employ the talents of geographers and social scientists who can not only visualize the relationships between the individual aspects of planning, but formulate integrated plans for the region in question. However, until regional planning becomes more widely recognized as a full-time adjunct of hospital construction programs, it will be difficult to encourage people to train specifically for this field.

It is therefore advisable to remove regional hospital planning from the present hospital construction agencies and group it with agencies engaged in other planning activities. Experienced planners, many of whom were trained as geographers or social scientists, are already at work planning for schools, housing projects, recreation facilities and the like. Many of the problems of regional hospital planning have their counterparts in other specialized fields of planning. Thus, community and regional planners already have a wealth of experience in activities similar to hospital planning which could be made available to the hospital construction agency. The inclusion of regional hospital planning in the curriculums of schools of planning would further improve the effectiveness of existing planning agencies.

The administrative difficulties of such an arrangement would not be insurmountable. Planning agencies have learned to cooperate with other construction agencies in the past and could readily add hospital construction agencies to the list. Certain specific advantages would accrue to the merging of regional hospital planning with other planning activities, including the more efficient use of personnel. If a state or region is unable to support a permanent, full-time hospital planner, the talents of an individual capable of performing this work would be better spent in other regional planning activities than in routine public health activities.

If this cannot be accomplished, it would be advisable to convince the technicians and administrators who are now entrusted with regional hospital planning of the need for a broader, more comprehensive approach to their subject. If this is to be accomplished, a wider range of literature should be produced in the much neglected field of regional hospital planning. If studies like this one can prove to be of help in the accomplishment of this goal, the effort expended in its creation will prove to have been worth while.

BIBLIOGRAPHY

Public Documents

- U.S. Dept. of Health, Education and Welfare, Public Health Service. How Many General Hospital Beds are Needed? Washington, D.C., 1953.
- U.S. Dept. of Health, Education and Welfare, Public Health Service. Public Health Service Regulations, Part 53, Pertaining to the Hospital Survey Construction Act, as Amended. Washington, 1955.
- U.S. Dept. of Labor, Bureau of Labor Statistics. Work Injuries in the United States, During 1952. Bulletin No. 1164, Washington, D.C., 1954.

Books

- Alaska Dept. of Health. Hospital Construction Plan of the Territory of Alaska. Juneau, 1953.
- Birch-Lindgren, Gustav. Modern Hospital Planning in Sweden and Other Countries. Medens Forlags Ab., Stockholm, 1951.
- Blair, Thomas A. Climatology. New York, Prentice Hall, 1943.
- California Dept. of Public Health. Hospitals for California. San Francisco, 1953.
- Colorado State Dept. of Public Health. Colorado State Plan for Hospital and Health Center Construction. 1953 Revision. Denver, 1953.
- Florida Development Commission, Hospital Section. Florida State Plan for 1956. Tallahassee, 1956.
- Florida Development Commission, Hospital Department. Florida State Plan. Tallahassee, 1957.
- Gallion, Arthur B. The Urban Pattern. New York, Van Nostrand Company, Inc., 1950.
- Georgia Dept. of Public Health, Division of Hospital Services. Georgia Master Hospital and Medical Facilities Plan. 1956 Revision. Atlanta, 1956.
- Hawaii Board of Health. Report of Hospital Survey and Planning. Honolulu, 1948.
- Indiana State Board of Health and the Indiana Advisory Hospital and Health Center Planning Council. Indiana Hospital, Medical Facilities and Health Center Plan. Indianapolis, 1956.

- Illinois Dept. of Public Health, Division of Hospital and Chronic Illness. Illinois Hospital Survey and Plan. Springfield, 1953.
- Kansas State Board of Health, Hospital Facilities Division. Kansas State Plan for Hospital Construction. Topeka, 1948.
- Michigan Hospital Study Committee. Michigan Hospital Survey Report. A.C. Bachmeyer, M.D., Director, Lansing, 1946.
- Mississippi Commission on Hospital Care. Mississippi State Plan for Construction of Hospitals. 1952 Revision. Jackson, Miss., 1952.
- Montana State Board of Health, Hospital Survey and Construction Division. Montana State Plan for Hospital Construction. Helena, 1948.
- Moretti, B. Franco. Ospedali. 3d ed. U. Hoepli, Milano, 1951.
- Mott, Frederick D., and Roemer, Milton, I. Rural Health and Medical Care. New York, McGraw-Hill, 1948.
- New Mexico Dept. of Public Health. New Mexico State Plan for Hospital Construction, Revision No. 6. Santa Fe, 1954.
- New York United Hospital Fund. Report of the Hospital Survey for New York, presented to the Survey Committee by its Study Committee. New York, 1937, Vol. II.
- Oregon State Board of Health. Oregon State Plan for the Construction of Hospitals and Public Health Centers. 1955 Revision. Portland, 1955.
- Rosenfield, Isadore. Hospitals, Integrated Design. 2d ed. New York, Reinhold Pub. Corp., 1951.
- South Carolina State Board of Health, Hospital Construction Section. South Carolina State Plan. Columbia, 1954.
- U.S. Dept. of Agriculture. Climate and Man, Yearbook of Agriculture. Washington, D.C., 1941.
- Utah State Dept. of Health. The State Plan for the Construction of Hospitals and Health Centers in the State of Utah. Salt Lake City, 1947.
- Vermont Hospital Survey and Construction Commission. The State Plan for the Construction of Hospitals and Health Centers in Vermont. Montpelier, Vermont, 1948.
- Wisconsin State Board of Health. Wisconsin State Hospital Plan. Madison, 1954.

Articles, Periodicals and Reports

- The Atlanta Constitution, May 4, 1953, p. 26.
- The Atlanta Constitution, Dec. 20, 1954, p. 1.
- Baz, Gustavo, M.D. "A Network of Hospitals is Mexico's Immediate Goal," Hospitals, Vol. 17, No. 8, Oct. 1953, pp. 45-47.

- Brooks, C.F., and Thiessen, A.H. "The Meteorology of Great Floods in the Eastern United States," Geographical Review, Vol. 27, No. 2, April 1937, p. 269.
- Burdett, Sir Henry. "Hospital," The Encyclopedia Britannica, 11th ed., Vol. XIII, pp. 791-801.
- The Carrollton Times-Free Press, Carrollton, Georgia, Dec. 17, 1954, p. 1.
- "Civil Defense Hospital," Science News Letter, Vol. 65, No. 21, May 22, 1954, p. 323.
- Clay, Clement C. "Consider the Possibilities of Decentralizing Hospitals to Minimize the Hazards of War, Nature and Traffic," The Modern Hospital, Vol. 70, No. 2, Feb. 1948, pp. 58-59.
- The Cobb County Times, Marietta, Georgia, April 7, 1955, p. 2.
- Cronin, John W., M.D. "Locations of Hospitals in Respect to Target Areas," The Military Surgeon, Vol. 112, No. 4, April 1953, pp. 236-242.
- Fisher, Alan. "There's Centralized Magic in the New Magic Valley Hospital," The Modern Hospital, Vol. 76, No. 3, March 1951, pp. 55-58.
- "Floods Force Hospital Evacuation," Hospitals, Vol. 30, No. 2, January 16, 1956, pp. 75-76.
- Georgia Hospital Care Study Commission. Indigent Hospitalization in Georgia. A report. Atlanta, 1957.
- Henderson, Robert S. "Freeway System of Benefits," Traffic Engineering, Vol. 26, No. 6, March 1956, p. 256.
- Hospitals. (A survey of occupancy rates of American hospitals.) Vol. 30, No. 15, Part 2, August 1, 1956, p. 22.
- Hye, Donald C., Hammond, Harold F., and Smith, Wilbur S. "What's Happening Downtown," Traffic Engineering, Vol. 25, No. 5, February 1955, p. 183.
- International Cooperation Administration, U.S. Mission to the Philippines. Annual Report, Health and Sanitation Division, Philippine-American Public Health Program. Manila, 1955.
- Mississippi Commission on Hospital Care. "List of Hospitals Built, Equipped and Occupied, 1946 to 1954," Jackson, Miss., 1954.
- "The Modern Hospital of the Month, Bristol Memorial Hospital," The Modern Hospital, Vol. 77, No. 1, July 1951, pp. 56-58.
- The New York Times, Dec. 5, 1955, pp. 1, 18.
- The New York Times, Feb. 3, 1956, p. 6.
- The New York Times, Oct. 9, 1957, pp. 1, 27.
- North Carolina Hospital and Medical Care Commission. Hospital and Medical Care for All Our People. Reports of Chairman and Sub-Committees, 1944-45. Raleigh, 1947.
- North DeKalb Record and Norcross News, Norcross, Georgia, October 20, 1955, p. 1.

- "North of the Border and 101 Feet Below Sea Level," The Modern Hospital, Vol. 76, No. 2, Feb. 1951, pp. 60-62.
- Rivin, Arnold A. "Hospitals in the Flood Crisis," Hospitals, Vol. 29, No. 10, Oct. 1955, pp. 72-75, 173.
- Rosenfield, Isadore. "Hospital Versus the Atomic Bomb," The Modern Hospital, Vol. 75, No. 6, Dec. 1950, pp. 58-60.
- Saskatchewan Health Survey Committee. Saskatchewan Health Survey Report, Vol. I. Regina, 1951.
- Stanton, H.F. "Oakwood Hospital Plans to Grow," The Modern Hospital, Vol. 77, No. 3, Sept. 1951, pp. 59-62.
- Stone, Douglas D., and Mulloy, Lou B. "One Staff Serves Two," The Modern Hospital, Vol. 76, No. 4, April 1951, p. 76.
- Stone, Douglas D., Mulloy, Lou B., Marraccini, Silvio P., and Green, Max E. "Simplicity at Sequoia," The Modern Hospital, Vol. 74, No. 3, March 1950, pp. 68-71.
- "The Thinking Behind Today's Small Hospital," Hospitals, Vol. 28, No. 3, March 1954, pp. 87-99.
- Urquhart, Clara. "A Visit to the Africa of Dr. Albert Schweitzer," Phylon, Vol. 14, No. 3, Sept. 1953, pp. 295-301.
- Yast, Helen. "The Settlement of 45 Roofs," Hospitals, Vol. 28, No. 5, May 1954, pp. 80-82.

Unpublished Material

- Georgia Dept. of Public Health, Division of Hospital Services. "Post-Audit Survey, Arlington City Hospital, Arlington, Georgia." Atlanta, May 1, 1952. (Typewritten.)
- Georgia Dept. of Public Health, Division of Hospital Services. "Post-Audit Survey of Kennestone Hospital, Marietta, Georgia." Atlanta, Dec. 29, 1952. (Typewritten.)
- Georgia Dept. of Public Health, Division of Hospital Services. "Post-Audit Survey of Lee M. Happ, Jr. Memorial Hospital, Hiwassee, Georgia." Atlanta, August 8, 1953. (Typewritten.)
- Georgia Dept. of Public Health, Division of Hospital Services. "Preliminary Statement and Survey of the Medical Needs on St. Simons Island." Atlanta, 1956. (Mimeographed.)
- Georgia Dept. of Public Health, Division of Hospital Services. "A Survey of Hospital and Medical Care Needs in Camden County." Atlanta, 1956. (Mimeographed.)
- Georgia Dept. of Public Health, Division of Hospital Services. "Survey of the Hospital and Medical Care Needs of the Cumming-Forsyth County Area." Atlanta, 1955. (Mimeographed.)

- Georgia Dept. of Public Health, Division of Hospital Services.
"Survey of the Need for Suburban Hospital Service
in the Atlanta Metropolitan Area." Atlanta, 1957.
(Mimeographed)
- Georgia Dept. of Public Health, Division of Hospital Services.
"Survey for a Psychiatric Hospital Facility in
Savannah, Georgia." Atlanta, 1956. (Mimeographed.)
- Georgia Dept. of Public Health, Division of Hospital Services.
"Survey for Second Addition to the Glynn-Brunswick
Hospital." Atlanta, 1957. (Mimeographed.)
- Metropolitan Planning Commission. "A Brief Study of the
Supply of and Need for General Care Hospital Beds in
Fulton and DeKalb Counties." Atlanta, 1954. (Mimeographed.)

Other Sources

- Letter to Dr. R. C. Williams, Director, Division of Hospital
Services, Georgia Department of Public Health, from
Mr. Elliot R. Jackson, Director, The Atlanta Metro-
politan Area of Civil Defense, October 13, 1955.
- Personal interview with Dr. Lloyd Moll, President, Georgia
Southwestern College at Americus, Atlanta, Nov. 7,
1955.
- Personal interview with Miss Bertha Mears, Hospital Adminis-
tration Consultant, Georgia Department of Public
Health, Atlanta, October 28, 1955.
- Personal interview with Miss Bethena Hilsman, R.N., Adminis-
trator, Gordon County Hospital, Calhoun, Georgia,
June 14, 1955.
- Personal interview with Miss Gaynell Hawkins, Program Repre-
sentative, U.S. Public Health Service, Atlanta,
January 18, 1956.
- Personal interview with Mr. A.A. Rosser, Administrator,
Glynn-Brunswick Memorial Hospital, Brunswick, Georgia,
March 3, 1955.
- Personal interviews with Mr. Millard Wear, Administrator,
Kennestone Hospital of Marietta, Georgia, in Atlanta,
August 30, 1955, and January 16, 1956.
- Personal interview with Mr. T.B. Wolfe, Jr., Administrator,
Polk General Hospital, Cedartown, Georgia, Sept. 11,
1953.
- Personal interviews with Mr. William E. Uzzell, Chief, Survey
and Planning Section, Georgia Department of Public
Health, Atlanta, Nov. 11, 1955, Nov. 15, 1955, and
March 5, 1956.
- Personal interview with Mr. William J. Anderson, Administrator,
Winder-Barrow Hospital, Winder, Georgia, Nov. 18, 1955.
- Testimony of Mr. Louis Jones, Funeral Director and Ambulance
Operator, at meeting of hospital advisory council,
Alpharetta, Ga., Jan. 18, 1956.

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This dissertation was prepared under the direction of the chairman of the candidate's supervisory committee and has been approved by all members of that committee. It was submitted to the Dean of the College of Arts and Sciences and to the Graduate Council, and was approved as partial fulfillment of the requirements for the degree of Doctor of Philosophy.

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